HEATING AND VENTILATING

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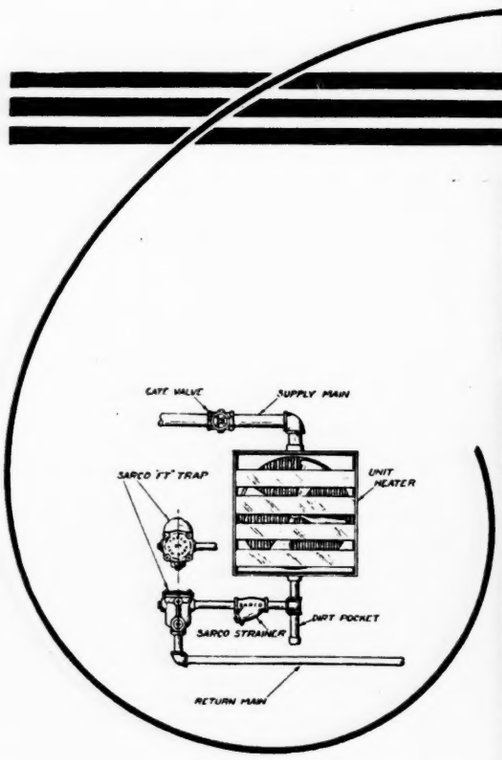

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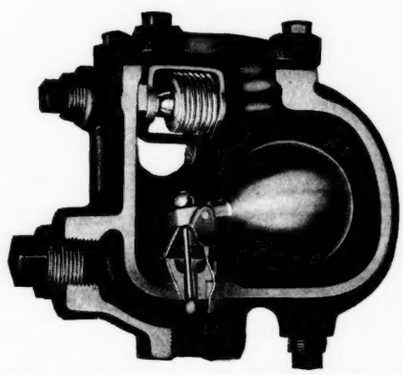

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Editorial

SINCE this issue is the first to be prepared entirely under the direction of the recently reorganized editorial staff, we consider it timely to make the immediate program and policy clear to our readers.

We expected the change in personnel to bring about two obvious and immediate results as well as others which are more distant. The immediate results are already accomplished. The former editor is now permitted to be relieved of active and full-time direction of the editorial work, while the increased staff makes it possible to keep in even closer contact with men and developments than has been possible heretofore. Under present conditions we believe that a close contact with the field is of the very first importance to an editorial staff.

It is a source of great gratification to us that we are able to retain the benefit of Mr. Armagnac's long connection with the magazine. For a period of nearly twenty-seven years, under his direction, the magazine has grown and prospered. Both the old and the new staffs are well aware that this is merely another way of stating that it has served its readers, patrons and friends well and faithfully, for no publication can long continue unless it does meet the needs of its readers. The change in personnel has obscured in no way the importance of this principle. Rather it has served to bring it sharply to our attention. Usefulness and service to our readers will continue to be the bedrock of the editorial policy. We shall continue to attempt to keep our readers' interests in mind while presenting authentic material of real value.

The whole past policy of the magazine has been to keep its readers fully informed of developments and changes in both the theory and practice in its field. In doing so, however, it has pursued a conservative policy, taking the attitude that it is better to hold fast to tried and proved practices rather than to advocate and overstress changes merely because they are changes. On the other hand, when once convinced that departures have been desirable and for the good of the industry, it has not hesitated to strongly advocate their use. Here, too, no change is anticipated. We shall continue to attempt to present new and fresh viewpoints, to keep abreast and to lead, but not to direct our efforts toward that which is bizarre, sensational and of passing interest and value only.

Changes have come rapidly in recent years. The whole field has been greatly altered by new conceptions, new methods, new apparatus and especially by a somewhat changed attitude on the part of the ultimate users of the final product toward which the whole industry directs its efforts. This change in attitude is notable whether the use be for domestic, industrial or commercial ends. It is difficult to determine whether the change in attitude is due to the improvements and changes in the practice, or if the change in attitude encouraged and caused the changes in practice. Regardless of which is cause and which is effect, the fact of the matter is that at the present we are faced with a greatly broadened field for both services and goods. Never has there been so great a need for intelligent and honest technical skill and knowledge, or for exact and reliable information. Never, either, has there been such a diversity of manufactured goods and apparatus with which to meet the demand. Not only has the field traditionally known as "heating and ventilating" greatly changed and broadened, but there is every reason to believe that the rate of change will continually accelerate rather than retard. Already there are definite indications that heating and cooling will soon be considered as complementary processes, to mention but one of the outstanding changes which have so greatly affected the field.

We shall continue to broaden the scope of the magazine to keep pace with the trends, and shall continue also to direct our efforts toward covering the entire field, regardless of changes in nomenclature.

We undertake our work with a thorough understanding of the responsibility which rests upon us to hold fast to the accepted standards of publication as regards content, arrangement, and relations with all our readers, as well as the responsibility of making the magazine of ever-increasing usefulness.

The feeling of responsibility is, however, accompanied by a wholehearted conviction that the opportunity afforded us is virtually unlimited in view of the solidity of interest of our readers in the field of heating and ventilating.

No one can assume an editorial position without receiving at once a full and deep appreciation of the very great dependence which every editor must place on the cooperation and assistance of the friends and readers. We sincerely hope that we may merit, and may continue to receive, the very fine support which you have given to the editorial staff of the magazine through the long period of its existence.

A Method of Attacking Certain Fog Problems in Industrial Air Conditioning

by Arnold Weisselberg*

The first of two articles by Mr. Weisselberg, describing a method of attacking the industrial fog problem through the use of a steam-air mixture chart. In this connection Mr. Weisselberg has translated the Mollier steam-air mixture chart into English units, making it available for use in this country. The chart is widely applicable to problems involving steam and air mixture and processes involving such mixtures.

In this article Mr. Weisselberg describes the chart and illustrates its use. In the second article, next month, he will show how the chart may be applied to problems of fog elimination in certain industrial plants.

THE change in the relation of water in any of its forms to air is at the bottom of all problems of heating, ventilating, air conditioning, drying, humidifying, dehumidifying and fog elimination. The change may take place either by action upon the state through the agency of thermal or physical effects or by interaction with air of different state. Usually both methods are used in the course of a process. The former is again subdivided into changes of state in which the ratio of water to air by weight remains constant, that is, they do not occur in the presence of moisture, and in changes of state in which moisture is added or removed. To the latter class belongs also the removal of moisture by adsorption which is based on the property of certain materials, such as sulphuric acid, silica gel and activated coal, to absorb moisture from the air.

Psychrometric charts are very useful tools for the study of changes in state of water-air mixtures and for the determination of the state of the mixture. In their present forms they are widely used by engineers who find in them the only efficacious means of solving their problems. Such charts, however, are limited in convenience and scope, as far as graphical presentation of processes is involved as well as in their application to problems involving the mixture of either two amounts of air of different state, or of air and steam, water or ice.

The engineer or research man who is confronted with such problems will find the I-X chart (I stands for heat content, X for pounds of water per pound air) developed by Professor Mollier, whose steam charts are in general use today, more serviceable. Although first made public in 1923, the I-X chart has not come into use until recent years. In 1929 Professor Mollier presented a more complete paper on this chart, enhancing its value by pointing out its great applicability.

During the past summer the writer's attention was called to this chart by engineers he visited in Germany. Appreciating its great utility, the writer made up a chart in English units as shown in Fig. 1, in order to apply it to some problems to which a fully satisfactory solution was still lacking. In addition to the lines given in the original Mollier Chart, it was deemed practical to enter also the lines of constant relative humidity, the vapor pressure line and the lines of constant specific weight. Reason for the last will be found in the two different ways in which the mixing of two amounts of air can take place, namely by natural diffusion and by forced diffusion. In the former the specific weight of the water-air mixture must be considered.

The use of the chart will be demonstrated by means of examples. Let us first note how the properties are determined at any state. Consider point A in Fig. 2, and we obtain the following: The dry bulb temperature is 100° F., the relative humidity is 30%, the heat content per pound of air above 32° F. is 30 B.t.u. By interpolating between the vertical lines and using the top scale, we find that the mixture contains 0.01224 lb. moisture per pound of air.

By interpolating between the thin lines sloping slightly upwards to-

*Consulting Engineer.

MOLLIER STEAM-AIR MIXTURE CHART

(For 29.9 Inches Mercury Barometric Pressure)

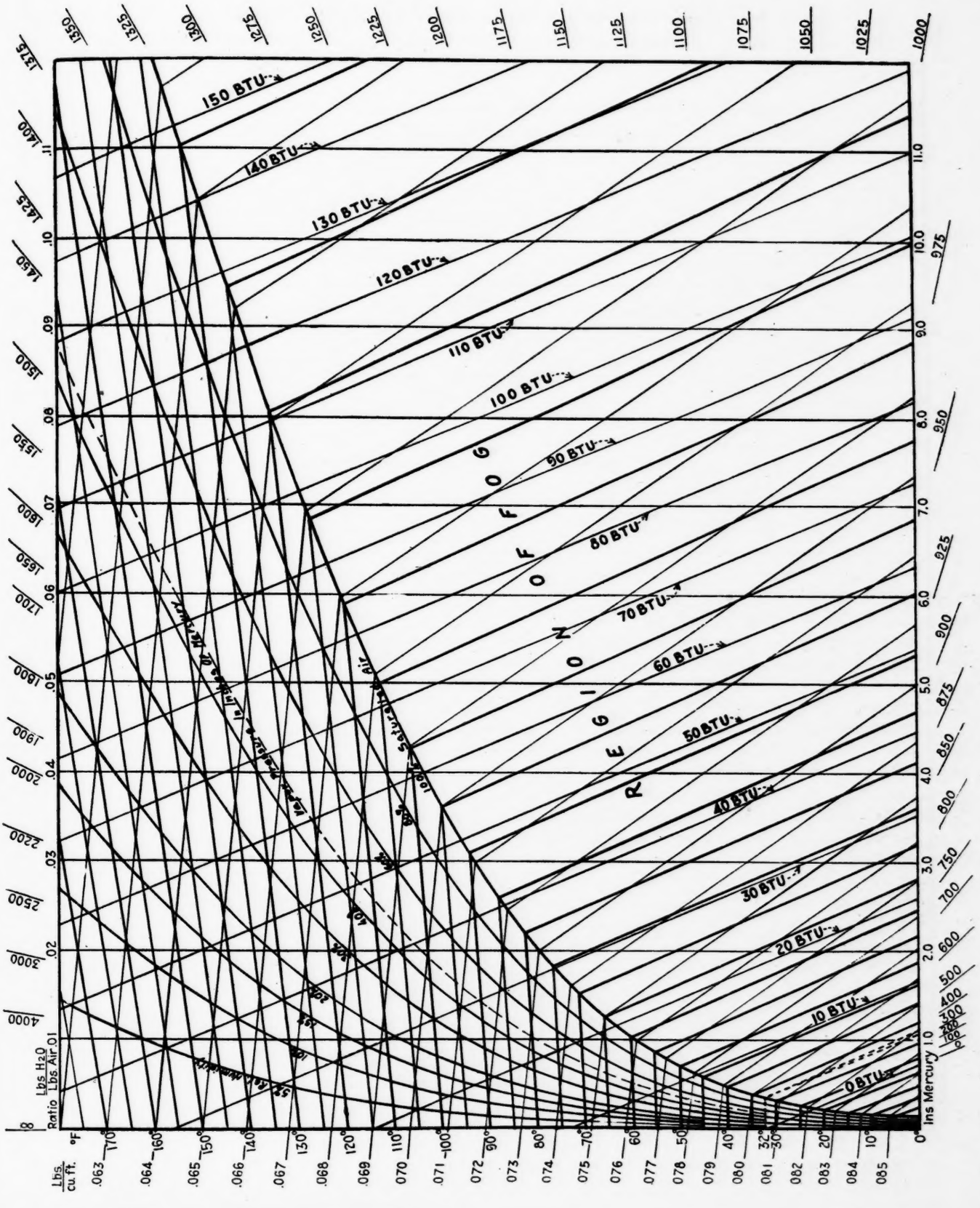

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Fig. 1.

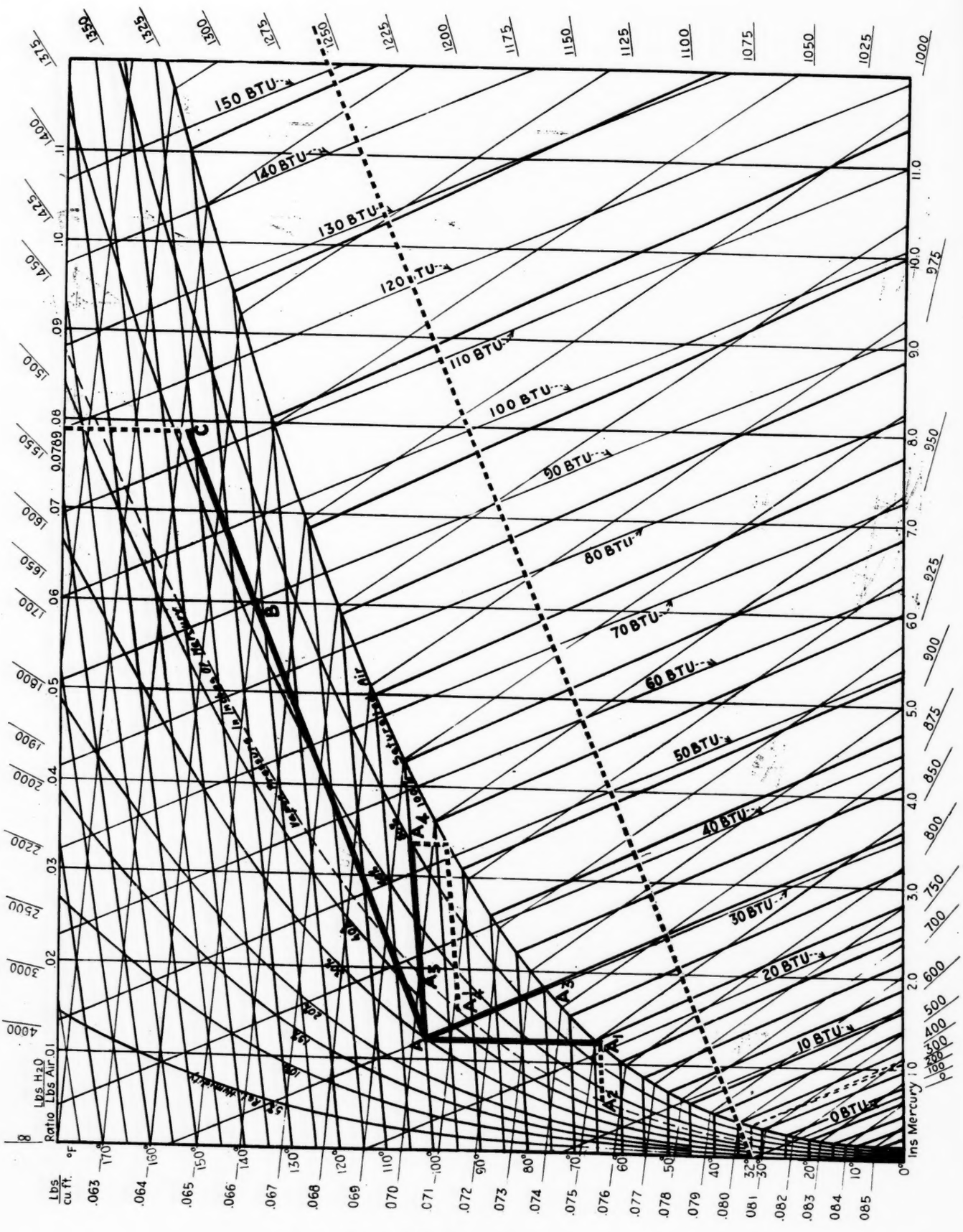


Fig. 2. Solution of Example Showing Use of the Mollier Steam-Air Mixture Chart

wards the left and using the extreme scale at the left, we read a specific weight of 0.07036 lb. per cu. ft. A vertical dropped from point A intersects with the boundary or saturation curve in point A_1, which is the dew point. The dew point temperature of 64° F. is read by interpolation between the isotherms. A line parallel to the temperature line intersects with the (dotted) vapor pressure line in point A_2.

Interpolating point A_2 between the vertical lines and using the bottom scale, we find that the partial pressure of the moisture in the air of state A, which is also the dew point pressure, is equal to 0.6 in. of mercury. If we follow from point A the line of constant heat content, i.e., along the 30 B.t.u. line in this case, the boundary or saturation curve is intersected at point A_3, which gives us the wet bulb temperature of 75° F.

Let us now assume that the mixture of the state designated by point A is permitted to absorb moisture. at constant temperature. This change will therefore follow along the 100° line on the chart. The amount of moisture absorbed per pound for each per cent increase in relative humidity can be read directly from the top scale. Thus, if the relative humidity reaches 80% (point A_4) the air of 100° F. contains 0.0337 lb. moisture per lb. air and the moisture absorbed while the relative humidity has been increased from 30% to 80% is equal to the projection of the distance A A_4 on the upper scale or 0.0337 — 0.01224 = 0.02146 lb.

We also note that by absorbing this moisture the heat content per pound has increased, state A_4 having a heat content of 53.7 B.t.u. (as found by interpolation between the 50 and 60 B.t.u. lines) as against 30 B.t.u. at state A, or an increase of 23.7 B.t.u. per lb. by increasing the humidity from 30% to 80%. In the same way, we find that, in order to reach the dew point A_1 when starting with air of condition A, the heat content of 30 B.t.u. per lb. has to be lowered through the agency of some cooling effect to the heat content of point A_1, which is 21 B.t.u. per lb.

The partial vapor pressure (or dew point pressure) of 100° F. air of 80% relative humidity (point A_4) is determined the same way as was done before for A, and is 1.55 in. of mercury (point A'_4). Vapor pressure of the fully saturated 100° F. air is found at the intersection of the temperature line with the pressure curve (point A_5) and is 1.94 in. of mercury.

We see, therefore, so far, that by this chart not only can we easily determine the values which characterize the state of the air of a certain condition, but can also very readily observe how all these values change with every kind of change in state.

It will be noted that this chart is made for a barometric pressure of 29.9 in. of mercury. Obviously, similar charts can be drawn for other than atmospheric pressure. Pressures below atmosphere, for instance, are used in connection with condensation and evaporation under vacuum.

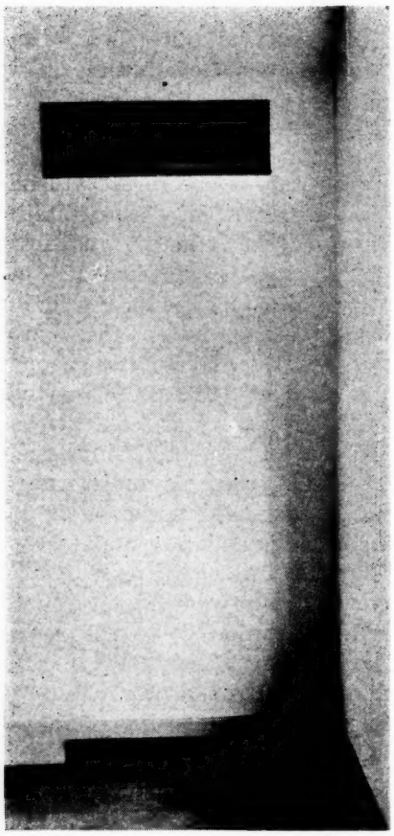
Let us now assume that air of the state A is changed through some means to attain the state B. We note that air of state B has a moisture content of 0.06 lb. per lb. of air and a heat content of 90 B.t.u. Therefore, the moisture content has increased over that at A by 0.06 — 0.01224 = 0.04776 lb. per lb. of air and the heat content by 90 — 30 = 60 B.t.u. per lb. of air, which means that the moisture added had a heat content of $\frac{1.0}{0.04776} \times 60 = 1256$ B.t.u. per lb. Moisture with such high heat content is found in the form of steam. Steam of 5 lb. gauge and 440° superheat has, for instance, a heat content of 1256 B.t.u. Hence, if we mix 1 lb. of this steam with $\frac{1.0}{0.04776} = 21$ lb. of air-steam mixture of state A the result will be 22 lb. of air-steam mixture of state B. If we connect A and B and draw a parallel line through the 32° point of the ordinate scale on the left, the extreme right end of this parallel intersects the marginal scale on the right at just 1256 B.t.u. In other words, the marginal scale gives the direction in which the change in state takes place if moisture of a heat content as entered on the marginal scale is added to the air.

Evidently we can reverse our question and ask what state would be reached if we were to add 4 lb. of steam having a heat of 1256 B.t.u. per lb. to 60 lb. of air of state A. We connect the 1256 line of the marginal scale with the origin of the marginal scale, which is the 32° point on the temperature scale and by drawing a parallel through A we have the path along which the change takes place. By dividing 4 lb. of steam by 60 lb. of air, we obtain the moisture increase per pound at 4/60 = 0.066, which, added to the initial moisture, brings the total up to 0.0789 lb. The intersection of the vertical through 0.0789 on the top scale with the line of direction furnishes the resulting state of the mixture indicated by point C.

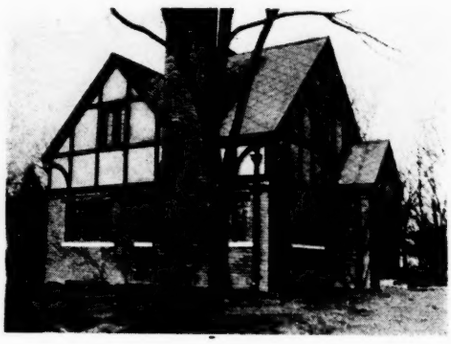
(To be continued)

Vapor Absorption System Installed in a New Jersey Worsted Plant

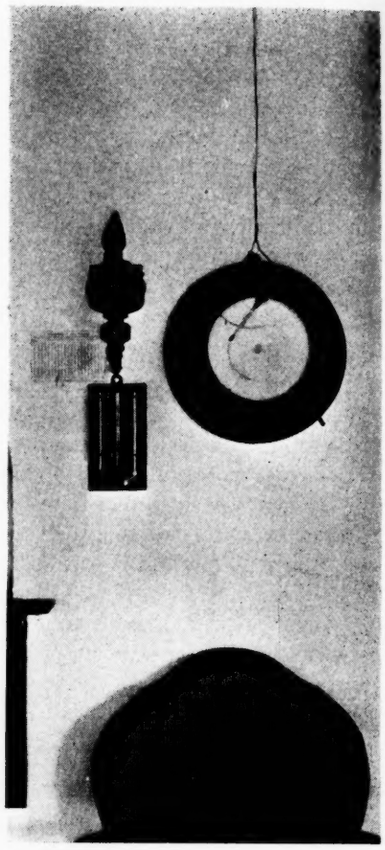
Operating Data from a Modern Insulated Building



Concealed Radiator on Second Floor. On this Floor Radiators are on Inside Wall



View of Residence from Southeast Taken When House was being Completed



Recording Thermometer and Hygrometer Located on North Wall of Living Room

by **Robley Winfrey***

THE subject of domestic heating became of interest to the writer in 1927 when building the home pictured here.

The heating system is a standard vacuum layout with a coal-fired water tube sectional boiler. All radiators are of the concealed type except one in the front entry which is a visible cabinet.

The boiler is fitted with a pressure regulator so connected that a boiler pressure of 6 to 8 oz. causes the regulator to close the draft. An additional slight pressure opens the check. When the pressure lowers, the check is closed, but the draft stays closed until opened by hand. The hot water for household and laundry use is heated by a water coil in the boiler. The illustration shows the house to be a story and a half in height, the upper outside finish being half timber and stucco, and the first floor, old paving brick. The first floor has an air volume of 7343 cu. ft., the second floor, 4472 cu. ft. The foundation plan is 26 ft. x 36 ft. The wall section for the first floor is 3½ in. of brick veneer, 1½ in. air space, 5 in. hollow clay tile, and about 1 in. of plaster direct on the inside surface of the tile, making a total wall thickness of about 11 in. The upper floor, has 1 in. of portland cement stucco and half timber, water proof paper, shiplap, 2 in. x 4 in. studding, gypsum plaster board and plaster. The space between studding is filled with a cellular gypsum insulation, which carries up over the sloping ceiling (exposed roof), across the ceiling and down the other side, thus enclosing the entire second story. Where the roof is exposed on the under side to the rooms, the insulation is 5½ in. thick, as the roof rafters are 2 in. x 6 in.

Windows are steel casement sash of ordinary grade and workmanship. They are not tight, but probably as much so as are the ordinary double hung wood sash. The three outside doors are weatherstripped, but no storm windows are used.

Careful calculation of the theoretical heat loss by the usual methods, and by assuming the usual coefficients with one air change and a temperature difference of 90°, together with a 10% exposure allowance for north, northwest and north-

*Engineering Experiment Station, Iowa State College.

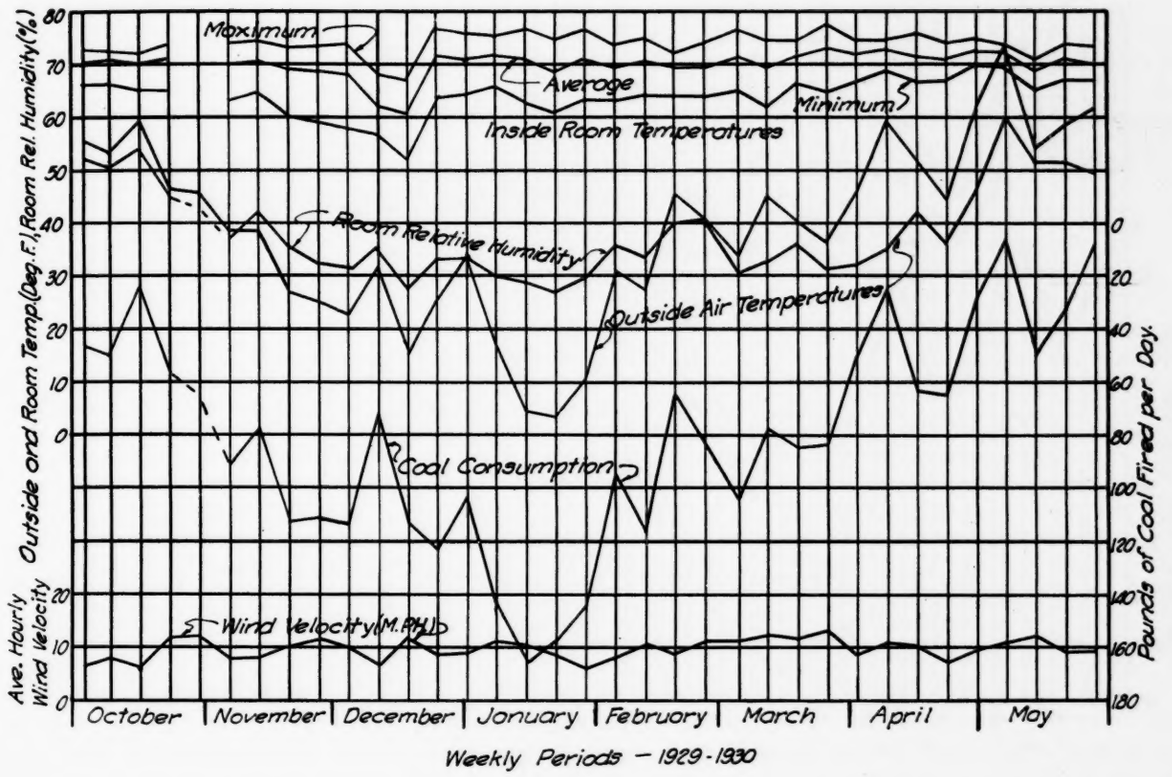


Fig. 1. Weather Conditions, Room Temperatures and Coal Consumption for Period 1929-1930

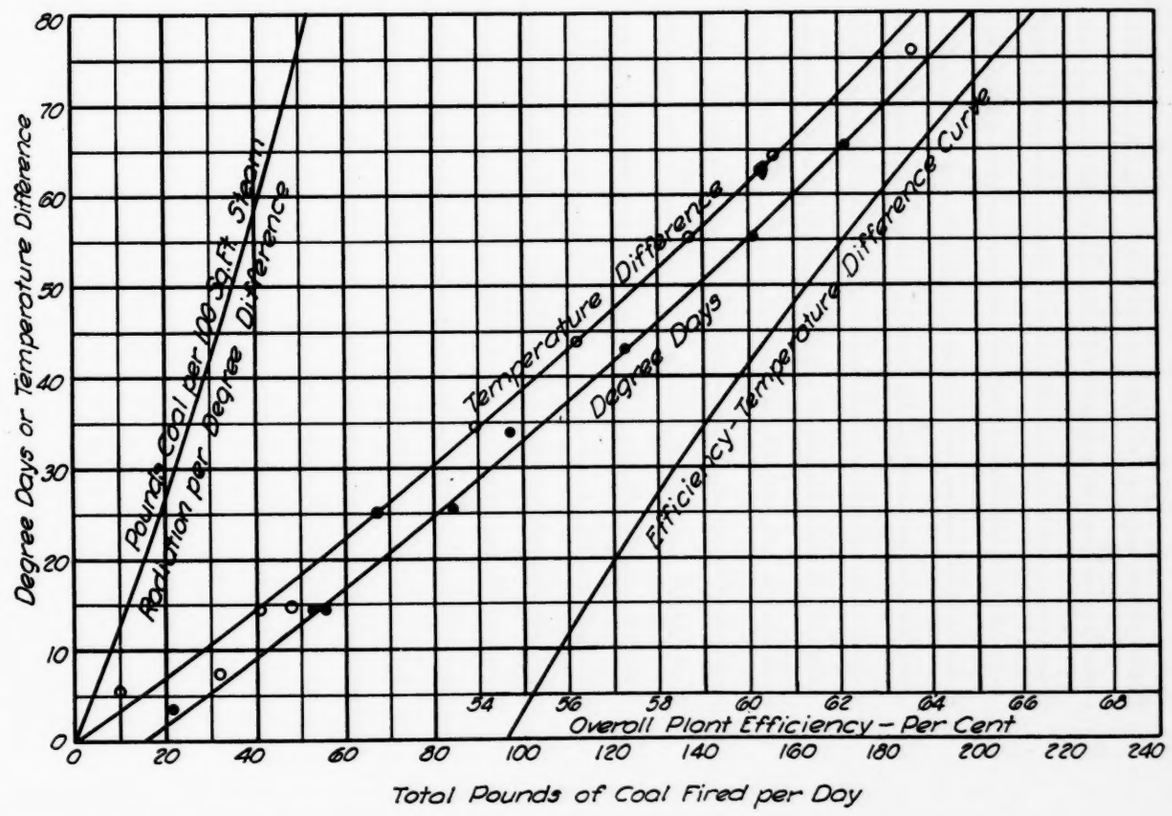

Pounds Coal per 100 Sq. Ft. Steam Radiation per Degree Difference
Temperature Difference
Degree Days
Efficiency-Temperature Difference Curve
Degree Days or Temperature Difference
Overall Plant Efficiency — Per Cent
Total Pounds of Coal Fired per Day

Fig. 2. Rate of Coal Consumption and Heating Plant Efficiency

east rooms resulted in a figure of 86,036 B.t.u. per hr. This corresponds to 358.5 sq. ft. of equivalent cast iron radiator.

In order to correlate the coal consumption, weather, radiation, and relative humidity, the writer kept records on his home from October 1, 1929 to May 31, 1930, excepting the week of October 27 to November 2. The weight of coal burned, the relative humidity, and the inside room temperature were recorded daily. Outside temperature records and wind velocities were obtained from the U. S. Weather Bureau, the former data being obtained from the observations by Iowa State College, at a point about one-half mile east of the house. As no local wind records were kept, those reported are for Des Moines, 30 miles to the south. The inside temperatures were recorded on 24-hr. charts. Relative humidity was determined at about noon from readings of wet and dry bulb thermometers.

Coal was weighed on spring scales as and when fired. One-inch screenings of washed Pocahontas coal were used. The analysis of the coal as fired was:

	%
Moisture	1.60
Ash	7.13
V.C.M.	18.22
Fixed Carbon	73.05
	100.00
Sulphur	0.61
B.t.u. per lb.	14,775

Under actual operation it was found that the house was kept comfortably warm by firing four to seven times a day. When placing coal on the grates, the live coals were pushed to the rear and the green coal leveled off just inside the firing door, which resulted in consumption of most of the gases as they were drawn back over the hot coals. Dense, black smoke was never observed coming from the chimney.

Fig. 1 shows the results of the entire season by daily averages over weekly periods. This shows the close correlation between the coal fired and the temperatures inside and out. When overfiring occurred, underfiring usually followed the next day, and vice versa. The inside temperature was maintained at 70.09° for the 24-hr. period over the 236 days without running the maximum above 80° on any occasion. The highest daily maximum average over any weekly period was 77.4°, which occurred the last week in March. The lowest daily minimum average was 51.9°, which occurred the week of December 15, when the house was not occupied during the daytime or evening.

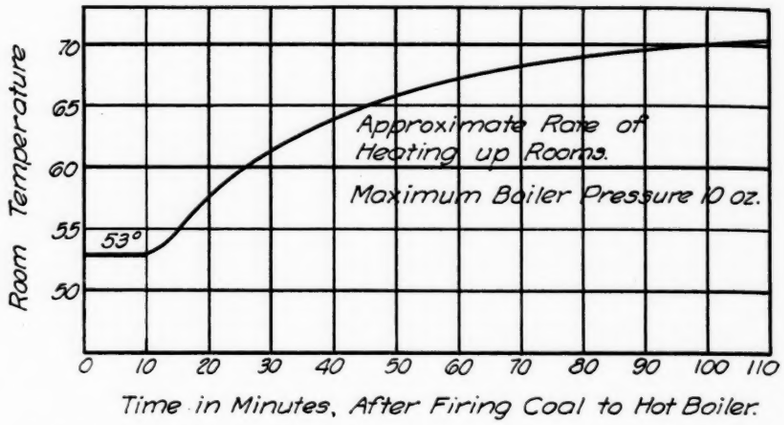


Fig. 3. Approximate Time Required to Heat Rooms from Hot Boiler

Other than about 5 quarts of water a day, evaporated from a pan on top of the boiler and from a wick within the heat cabinet in the entry, no moisture was added to the air in the house. (Except of course that which came from ordinary household operations of cooking, washing, and floor scrubbing.) The relative humidity curve followed (see Fig. 1) very closely the outside air temperature changes, probably much closer than would be expected.

The coal consumption curves in Fig. 2 are drawn from data which were obtained by summarizing the daily records by degrees difference or by degree days. They are concave upward, showing that less coal was required per degree day, or degree difference, as the total heating load increased. Fig. 2 also shows the coal consumption per day per 100 sq. ft. of steam radiation.

From the coal consumption indicated by the curve "degree difference" in Fig. 2, the overall heating plant efficiency was calculated on the basis of the theoretical heat loss and the B.t.u. value (14,775) of the coal. Such a curve is shown in Fig. 2, and whether or not it indicates true heating plant efficiencies, it does show that the ratio increases from 1.29 to 1.74% for each 10° of added temperature difference.

An interesting point in connection with the concealed heaters occurred during the season. About the first of March it was noticed that certain heaters were not giving out heat as they should. This was particularly true in rooms where ironing, baby clothes, and bedding were handled. Examination showed that the under surface of the metal sheets forming the heating surfaces had become covered with lint and fine dirt. As soon as this was removed with a vacuum cleaner, proper heating was resumed.

A few observations were made of the time required to heat up the house from a low temperature, but from a hot boiler. The average of these is shown in Fig. 3. It was especially noticeable that it took a much longer time to raise the room temperature from 60° to 70° than it did from 50° to 60°. The flattening out of the curve substantiates this observation. This type of performance is probably one reason why the house was not often overheated, and it is a favorable characteristic except when heat is wanted in a hurry.

While the 1929-30 heating season records indicated that the coal consumption per degree day increased as the weather became warmer, the opposite held true the spring following the completion of the house. At this time the coal was weighed during February, March, and April, 1928, and found to be at the rate of 3.75, 3.66 and 3.56 lb. per degree day, respectively. The explanation of this is that the house held considerable moisture in the insulation, plaster, and framing, and additional heat was supplied for the evaporation of this moisture, the amount of heat required gradually growing less.

Value of Oil Burner Installation Surveys

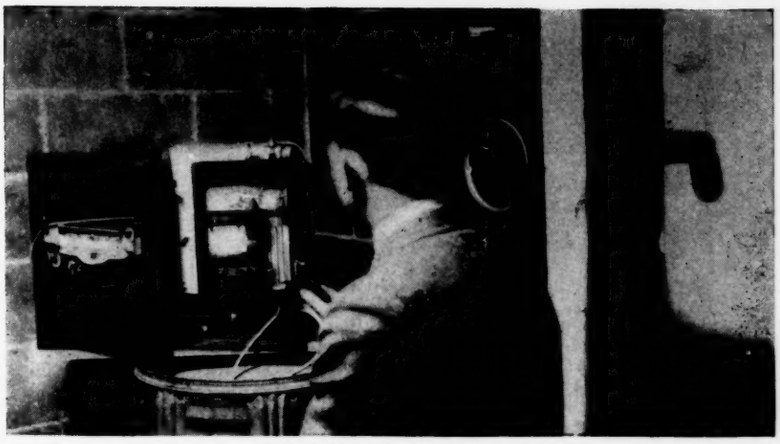


Fig. 1. Analyzing the Flue Gases. Note the Automatic Damper for Maintaining Constant Furnace Draft

by **R. C. Cross**[1]
and
W. R. Lyman[2]

Application of scientific methods to check burner installations is no longer questioned by progressive oil burner manufacturers and heating contractors. Adjustment of an oil burner by rule-of-thumb methods generally will not result in as satisfactory operation as would be found if the adjustments were made with the aid of proper instruments.

The authors show the results of a number of typical surveys and demonstrate the actual value of such efforts. The introduction discusses the function of an oil burner and its relation to the other units of the heating system.

AN oil burner is a device for converting liquid hydrocarbons into gaseous hydrocarbons and providing a means for the combustion of the latter. Since the heat of this combustion is the initial source from which the boiler, and in turn, the heating system receive their thermal units it is obvious that the proper operation of the oil burner is of considerable importance.

A heating system using oil consists of a fuel, a device to burn the fuel (the oil burner), a device to absorb the heat of combustion (the boiler), and an arrangement for distributing the heat where it is desired (piping, radiation, etc.). Naturally the overall efficiency of the heating system is dependent upon the efficiency of the component parts.

Therefore, it is well for the one responsible for the burner installation to assure himself that the other units in the heating system are well balanced and adapted to the burner itself. The fuel should be of the proper grade, the boiler of efficient type and proper size, and the piping and accessories should be inspected for possible defects in material and installation which might react unfavorably upon the performance of the plant. This is particularly true in existing installations where a change to oil burning introduces a new element. A study of the other elements is required and such a study would naturally be made by the one introducing the change. Such an investigation if carried out in the proper manner should insure genuine interest and cooperation from all concerned.

There are many factors which affect the operation of oil burners, such as fuel conditions, rates of oil delivery, furnace construction, inherent characteristics of burner type, and boiler characteristics. Since a wide variation occurs in many of these factors and each represents a problem in itself, they cannot be considered in detail in this discussion. Each must be allowed for so far as possible in every installation. The type of combustion which will be obtained is somewhat dependent upon the care exercised in allowing for these variable factors. However, with any given set of conditions there still remains the final determining factor of combustion control —the adjustment of the oil burner itself.

With mechanical draft burners the following items are controllable and ultimately fix the combustion obtained:

1. Rate of oil delivery.
2. Rate of air supply.
3. Draft in furnace.

OIL DELIVERY EFFECT

Rate of oil delivery is usually controlled by means of a valve which either acts directly upon the feed line or on a pressure control on the oil pump. A secondary control of oil delivery may be found in the orifice or nozzle from which the fuel is discharged. By balancing various combinations the best setting for a specified delivery is obtained. With

1—*Supervising Engineer, The H. B. Smith Company.*
2—*Test Engineer, The H. B. Smith Company.*

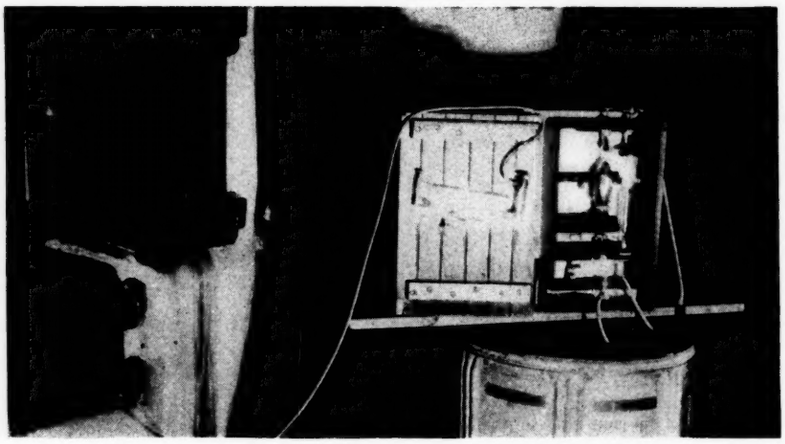


Fig. 2. Equipment for Determining Furnace Draft

Fig. 3. Measuring Flue Gas Temperature

a knowledge of these combinations and by determining the heating load requirements and boiler characteristics, i.e., efficiency and furnace volume, the proper combination to control the rate of oil delivery can be selected. Some boiler manufacturers are in a position to furnish the necessary boiler information, including in some instances specifications as to rate of oil delivery best suited to their boilers, while in other cases there is little to depend on except experience.

Rate of air supply is a controllable factor due to the provision of suitable shutters or fan elements which allow a close control on the air delivered. Before adjusting the air rate it is necessary to compensate for the third factor—draft in furnace.

It is recognized that a secondary source of air due to leakage in the boiler setting is present in the majority of installations and since this often tends to destroy the effectiveness of the air delivered by the burner, it is highly desirable that it be reduced to a minimum. Obviously the amount of this air leaking in will be determined by the draft pull in the furnace. *To obtain the best results with an oil burner it is important that the furnace draft due to the pull of the chimney be reduced as low as is consistent with the proper disposal of the gases of combustion.* When using mechanical draft type of burners and with the general run of conditions, this should not be allowed to exceed 0.02-0.05 in. of water and it is strongly recommended that a stack damper of the automatic type be installed to maintain this value. A further point in connection with properly adjusted furnace draft is that during the "off" periods of an "on-off" burner

TABLE 1—SURVEY DATA

Survey Number	Type of System	Radiation Load, Sq. Ft.	Before adjustment				After adjustment				Increase of CO_2 %	Increase in Efficiency of Heat Absorption, %	Percent Fuel Saving, (2)
			Draft Over Fire, In. Water	Flue Temperature, °F.	CO_2 %	Efficiency of Heat Absorption % (1)	Draft Over Fire, In. Water	Flue Temperature, °F.	CO_2 %	Efficiency of Heat Absorption, % (1)			
2801	Vac.	3200	.135	492	7.2	74	...	480	9.2	77	2.0	3.0	4.2
2802	St.	300	.185	595	5.0	61	.05	495	6.6	67	1.6	6.0	8.8
2803	St.	500	.032	467	6.0	72	.01	470	8.2	76	2.2	4.0	5.4
2804	St.	700	.05	257	5.6	82	.02	260	7.6	85	2.0	3.0	3 1
2805	St.	625	New installation			..	.05	380	9.2	82	...	...	...
2806	St.	1750	New installation			..	.02	285	8.8	84	...	...	...
2807	H. W.	900	.07	400	9.4	81	.03	405	10.2	83	.8	2.0	2.1
2908	St.	500	....	...	...	..	.02	467	7.2	76	...	...	...
2909	H. W.	750	.08	417	3.8	67	.04	422	6.0	75	2.2	8.0	10.9
2910	St.	1350	New installation			..	...	387	7.8	80	...	...	....
2911	St.	350	.10	525	5.0	65	.05	500	7.0	73	2.0	8.0	11.0
2912	St.	575	....	...	...	..	.01	390	8.0	80	...	...	....
2913	St.	575	.08	522	5.8	68	.04	487	9.2	77	3.4	9.0	12.1
2914	Vac.	3400	New installation			..	.05	275	10.2	86	...	...	....
3015	St.	....	.230	663	5.2	58	.05	252	10.8	87	5.6	19.0	33.0
3016	H. W.	5950	.172	483	7.5	75	.05	343	9.2	83	1.7	8.0	9.4
3017	St.	550	.05	723	7.5	64	.05	745	10.4	69	2.9	5.0	7.2
3018	Warm air	....	.05	468	8.4	77	.04	490	11.8	79	3.4	2.0	2.6
3019	St.	500	.10	887	8.8	61	.04	818	12.4	71	3.6	10.0	14.0
3020	H. W.	600	.02	525	6.2	71	.02	507	9.6	78	3.4	7.0	9.0

(1) Values obtained from Fig. 4, assuming 60° room temperature, an average value. These values are not overall boiler efficiencies because unaccounted for losses are unknown. However, with a particular boiler the unaccounted for losses being of the same order, would result in the overall boiler efficiencies varying directly with the change in efficiency of heat absorption as shown in the chart.

(2) Computed from efficiency values.

a reduced loss of heat due to the passage of colder air through the furnace will result.

Having determined the proper rate of oil delivery and the furnace draft being set to a correct value, the air supply should be adjusted until the optimum combustion conditions are obtained. The only way in which this can be done correctly and a definite standard obtained is by analyzing the flue gases by means of an Orsat or similar instrument. It is recommended that every one concerned with burner installation familiarize himself with the rudiments of gas analysis and obtain a practical knowledge of combustion from some reliable source. The actual use of the Orsat apparatus in the field is comparatively simple once the principle is understood.

Experience has led us to believe that a CO_2 content of 10%-12% represents good practice for oil burning installation and this value should be set as a criterion for quality of combustion. It is true that values of CO_2 as high as 14%-15% are sometimes possible, but it may be found in such instances that an appreciable loss due to unburned hydrocarbons is present. A further point in this connection is that the gain in efficiency of heat absorption is *not proportional* to the percent change in CO_2. Fig. 4 indicates this quite clearly, showing a lesser gain for a change of say 12%-14% CO_2 as compared with 8%-10% CO_2.

Referring to the survey form sheet note was made of the various installation facts before testing the burner. In the case of burners which have been previously installed and checked "by eye" an effort was made to determine the burner performance as initially found. The necessary adjustments to obtain the best combustion possible were then made and noted on the survey sheet as well as the combustion data.

The instruments used in conducting these surveys were an Orsat of the portable type, an inclined draft gauge, a 200°-950° flue thermometer and necessary tubing for connecting the various instruments to the boiler. A knowledge of these instruments and their proper use is not difficult to acquire. Combustion test kits composed of the above instruments can be purchased at reasonable cost and it is believed that such an investment is well worthy of the consideration of anyone engaged in the sales, installation or servicing of oil burners.

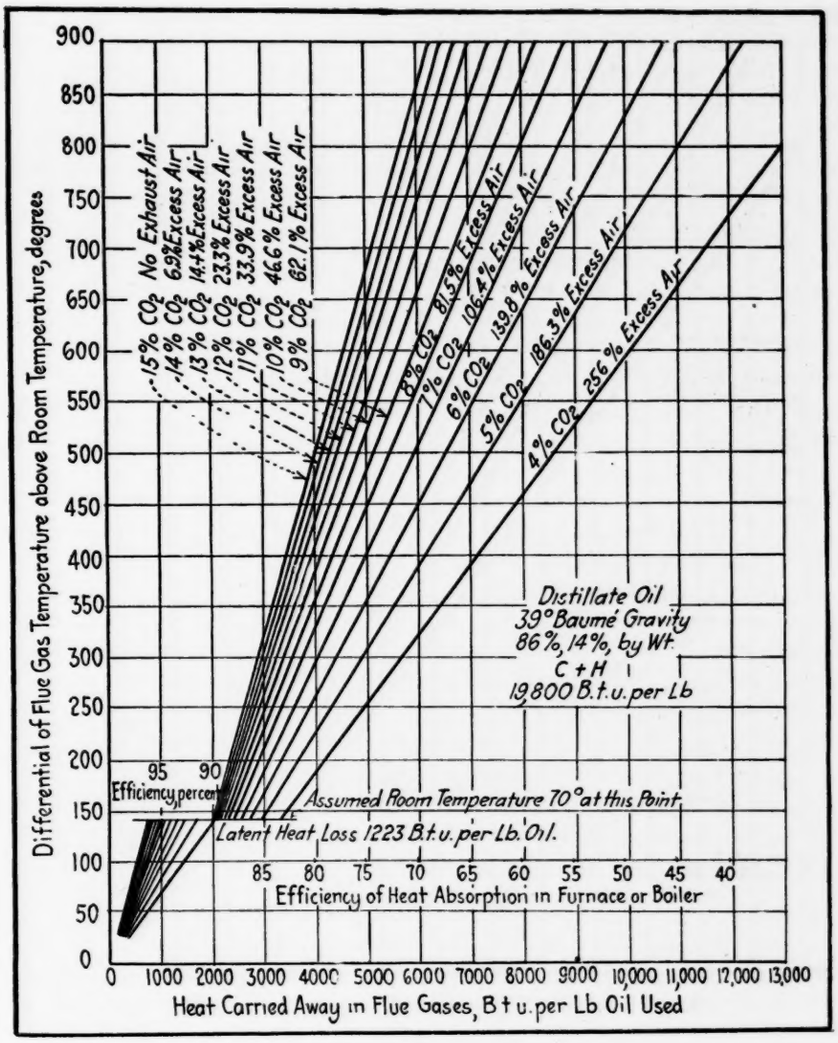


Fig. 4. Chart for Determining Efficiency of Heat Absorption in Oil-Fired Systems

The following table contains in summarized form the results of a number of surveys.

SURVEY FORM SHEET FOR OIL BURNER INSTALLATIONS

Survey No.
Date
Survey by

INSTALLATION DATA

Owner
Address
Type heating system
Radiation
Boiler data
Make of boiler
Size of boiler
Date boiler was installed
System installed by
Chimney dimensions

BURNER DATA

Model
Serial No.
Nozzle
Pressure
Control
Installed by
Date of installation

SURVEY DATA

Before adjustment
Flue temperature .°F.
Draft in furnace—inches water
Gas analysis
CO_2
O_2
CO
Flame
Air opening (fan)
Notes: (Any change of adjustment or observations noted here)

After adjustment
Flue temperature °F.
Draft in furnace—inches water
Gas analysis
CO_2
O_2
CO
Flame
Air opening (fan)
Notes: (Any conclusions or recommendations noted here)

DISCUSSION OF RESULTS

These results indicate in themselves the value of such effort. It will be noted that in every instance it was possible to better the combustion and effect an appreciable saving. A further point which is of interest is the type of combustion obtained in the surveys of new installations. These jobs were installed after the campaign of check surveys was started and indicate the general betterment of conditions as compared with the results obtainable in old jobs. On the latter it was impossible in most instances to get the desired 10% CO_2. This was largely due to less care having been exercised in installing the boiler, checking the boiler setting and supplying the proper method of draft control.

We have seen from the above remarks that certain definite improvements in the operation of oil burners can be accomplished by check surveys of installations. The advisability of such work cannot be questioned when the effect upon the various interested parties is considered.

The resultant savings are naturally a direct benefit to the man who pays for the fuel—the property owner. He pays an appreciable sum for an oil burner and rightfully expects that this device will be adjusted to work at its maximum efficiency.

Since the good-will and satisfaction of his customers is the contractor's or dealer's best unseen salesman, they will profit by creating a reputation for installing burners to the best advantage.

The boiler manufacturer often sees his product stand or fall according to the manner in which the burner is operated, and he, too, will profit by correct burner performance.

The resultant effect upon the burner manufacturer is far reaching. The householder will demand his product, the dealer or contractor will be pleased with a line which results in satisfied customers and the boiler manufacturer will have confidence in his burner.

Considering the benefits derived from oil burner installation surveys it would seem that their value cannot be overestimated and that the effort and expense involved are well worth while.

Heating the Yacht *Bluebell* by Electricity

by **J. Murray Watts**

HISTORY was made for the annals of modern electricity with the completion of the "Bluebell," a doubly unique yacht, launched from the Lower Bank Boat Works, near Atlantic City, November 23. It was built for Albert T. Bell, director of Chalfonte-Haddon Hall, who is widely known both as a hotel man and as president of the National Fire Protection Association.

The "Bluebell" is the first vessel to employ electricity as the only fuel for a modern system of heat radiation. The system is identical with the hot water storage tank method of electric heating now being introduced for domestic use. The heating elements themselves are permanently concealed within a pair of highly insulated water tanks in the engine room.

Mr. Bell wanted to assure maximum fire safety for his yacht. The complete elimination of flame and fire from the yacht, through the automatic electric hot water system of heating, insures fire safety.

The "Bluebell" is a 76 ft. x 15 ft. Diesel engine yacht, powered with two Treiber 12-cylinder Diesel engines of 600 hp., which are operated by fuel oil. It was designed by J. Murray Watts of Philadelphia.

Electricity for the heating equipment, lighting, etc., can be supplied from a public utility outlet at the waterfront, thus making it unnecessary to operate machinery when the yacht is idle.

The heating system for the "Bluebell" had to be located in the engine room, and it was desired that there should be no open flame in the engine room, so as to reduce the fire risk as much as possible. It was, therefore, decided to install a hot water radiator heating system, which was operated by two plants in the engine room, consisting of an electric water storage system, with two hot water tanks having 200 gal. total capacity. In each of the tanks were installed six 5 kw. heating elements, giving a maximum total of 60 kw. at 230 volts, although at the usual speeds of engine and generator the lower voltage would give about one-fourth of this input, which is sufficient. The temperature of the water is 250°. This hot water is circulated by means of a 1/6 hp. pump to 14 brass radiators, installed in the three staterooms and two salons in the owner's quarters, and also in the galley, crew's quarters, and pilot house.

One of the interesting features of the yacht is the fact that the water in the tanks stores the heat for many hours, so that it is not necessary to operate the Diesel engine generators at night, and so disturb the repose of the guests. To conserve this heat, rock wool insulation, 5 in. thick, was fitted around the tanks.

The water system operates under a moderate pressure of 25 lb. A thermostatic radiator valve is installed on the return side of each radiator, which remains closed till the water in the radiator has cooled to 150°. All piping is of red brass with bronze valves.

Estimating and Designing Heating Systems

XIII—One Pipe Steam Systems

by **Fred W. Hanburger***

THERE are many able texts on steam heating systems giving the best prevailing rules of practice to be used in design which when rigorously adhered to will result in smooth operation. The discussion in Chapter 20 of the American Society of Heating and Ventilating Engineers Guide for 1930 is particularly clear and complete. It is sometimes necessary to deviate from these standard rules of practice and the student will gain greater confidence in making such deviation after he has analyzed and studied the origin of the rules and the principles upon which they are based.

Let us consider the one pipe steam heating system for a four-story building as shown in Fig. 31.

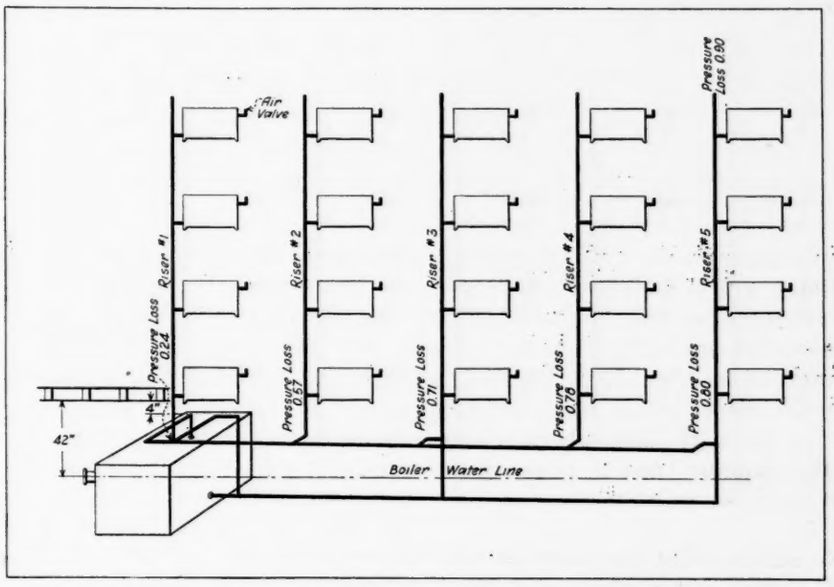


Fig. 31. One Pipe Steam System for Four Story Building

Assume that the measured length of main between each set of risers is 50 ft. of 2-in. pipe and that the distance from the boiler to the first riser is also 50 ft. of 2½-in. pipe, that the main consists of 2½-in. pipe from the boiler to the first riser and of 2-in. pipe from the first riser to the end of the run. All risers are 1½ in. The cellar is 42 in. above the boiler water line, the outlet from the boiler rising to within 4 in. of the ceiling, and the main is then graded 1 in. in 30 ft. from this point to the end of the main, giving a total drop of 8 in. The connection of the main to riser No. 5 will then be 12 in. below the ceiling, or 30 in. above the boiler water line.

In general practice a water line of 24 in. at the low point of the main is considered good practice, but where, as in this case, the piping appears to be restricted it is better to calculate the friction loss or pressure drop in the system so as to determine how much water height is actually needed. For this purpose the Unwin or Babcock formula is most generally used. A chart based on this formula is shown in Fig. 32.

Resistances due to fittings must also be considered. This is best done by expressing the resistance in an equivalent length of straight pipe, as given in Table 15. In the section from the boiler to and through the tee to riser No. 1 there are

Referring to the chart it is found

2 ells equivalent to		14 ft. of pipe
1 tee equivalent to		20 ft. of pipe
1 valve equivalent to		25 ft. of pipe
	and	50 ft. of actual pipe

a total of 109 ft. of equivalent straight pipe.

that the friction through 100 ft. of 2½-in. pipe for 1200 sq. ft. of radiation is 0.22 lb. per sq. in. The friction through 109 ft. will then be

$$0.22 \text{ lb.} \times 1.09 = 0.24 \text{ lb. per sq. in.}$$

In the section from riser No. 1 to No. 2 there are two tees equivalent to 32 ft. and 50 ft. of actual pipe, making an equivalent length of 82 ft. The friction through 100 ft. of 2-in. pipe carrying 960 sq. ft. of radiation is 0.40 lb. per sq. in., so that the total for the section will be

$$0.40 \text{ lb.} \times 0.82 = 0.33 \text{ lb. per sq. in.}$$

and the total friction from the boiler to riser No. 2 is then

$$0.24 + 0.33 = 0.57 \text{ lb. per sq. in.}$$

Similarly the friction from riser No. 2 to riser No. 3 is found to be 0.14 lb. per sq. in., from riser No. 3 to No. 4 is 0.07 lb. per sq. in. and 0.02 lb. between risers No. 4 and 5. The total friction, or pressure drop from the boiler to the end of the main is then

0.24 lb. + 0.33 lb. + 0.14 lb. + 0.07 lb. + 0.02 lb. = 0.80 lb. per sq. in.

The pressure drop in riser No. 5

*Special Lecturer on Heating and Ventilation, College of the City of New York.

TABLE 15

MAXIMUM ALLOWABLE CAPACITIES OF UP-FEED RISERS FOR ONE-PIPE LOW PRESSURE STEAM

Based on A. S. H. V. E. Research Laboratory Tests

PIPE SIZE INCHES	VELOCITY FEET PER SECOND	PRESSURE DROP OUNCES PER 100 FT	CAPACITY		
			Sq. Ft. Radiation	B.t.u. per Hour	Lb Steam per Hour
A	*B*	*C*	*D*	*E*	*F*
1	14.1	0.68	45	10,961	11.3
1¼	17.6	0.66	98	23,765	24.5
1½	20.0	0.66	152	36,860	38.0
2	23.0	0.57	288	69,840	72 0
2½	26.0	0.54	464	112,520	116 0
3	29.0	0.48	799	193,600	199 8
3½	31.0	0 44	1144	277,000	286 0
4	32.0	0.39	1520	368,000	380 0

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to and through the valve to the top radiator will be possibly 0.10 lb. per sq. in. more, so that to have a full supply of steam to this radiator most distant from the boiler the boiler pressure must be at least 0.90 lb. per sq. in. with atmospheric steam at the radiator and a pressure of 0.10 lb. per sq. in. at the foot of riser No. 5.

No matter what the pressure carried at the boiler, the pressure on the water column in the drip from riser No. 5 will always be 0.80 lb. per sq. in. less than the boiler pressure and the water in the drip must build up until it has attained a height sufficient to overcome this unbalanced condition before any water will return to the boiler. It takes approximately 30 in. of water column at this temperature to create 1.00 lb. per sq. in. pressure. Therefore, the water in the drip will reach a height of

0.80 lb. × 30 in. = 24 in.

above the boiler water line or within 6 in. of the connection to the main, where, if the water should reach this point it would cut off the steam from riser No. 5.

Consequently, we have a margin of safety of but 6 in. of water in height, equal to only 1/5 of a lb. per sq. in. in pressure.

This is not enough. During continuous firing it might be sufficient but in firing up when the system is cold the rate of condensation is so rapid and the demand for steam so great that the pressure drop increases enormously. A rule often used is to have the estimated pressure drop no greater than one half the available water height.

In this case, then, the friction loss to the end of the main should not be greater than 15 in. of water head, or 0.50 lb. per sq. in. Even though the system were designed for a pressure drop of but 0.50 lb. per sq. in. in the main we would still 'be playing with fire,' as the friction is affected by very slight discrepancies in the piping. When we are using high velocities this is strongly apparent. An unreamed pipe end where the pipe has been cut with a three wheel cutter can increase the friction 50%, and often to 100% when a one-wheel cutter is used.

Good engineering judgment then indicates that the pressure drop be kept as low as possible. This will also lend itself to a more evenly balanced system. Referring back to the original layout, the pressure drop to the last radiator on riser No. 5 is 0.90 lb. per sq. in. To have the system balanced the pressure drop to each other radiator should be the same. If it were considerably less than this amount the radiators would become fully heated long before the steam reached the less favored radiators, resulting in opened windows and gasping tenants.

As the loss to the foot of riser No. 1 is but 0.24 lb. per sq in., the piping from the main to the radiator would need take up

0.90 lb. — 0.24 lb. = 0.66 lb.

per sq. in. of friction.

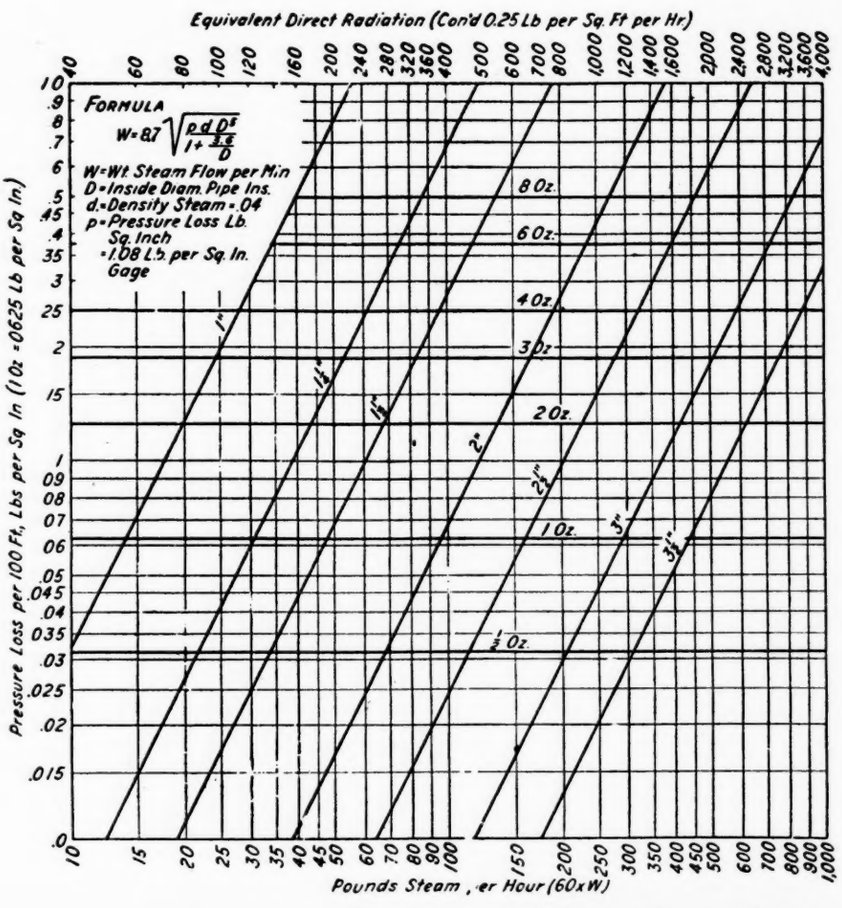
Equivalent Direct Radiation (Con'd 0.25 Lb per Sq Ft per Hr)
FORMULA
W = 8.7 √(p d D⁵ / (1 + 3.6/D))
W = Wt Steam Flow per Min
D = Inside Diam. Pipe Ins.
d = Density Steam = .04
p = Pressure Loss Lb. Sq. Inch = 1.08 Lb. per Sq. In. Gage
8 Oz.
6 Oz.
4 Oz.
3 Oz.
2 Oz.
1 Oz.
½ Oz.
Pressure Loss per 100 Ft, Lbs per Sq In (1 Oz = .0625 Lb per Sq In)
Pounds Steam per Hour (60 x W)

Fig. 32 (a and b) Friction Pressure Loss

Reprinted by permission from "Mechanical Equipment of Buildings,"

To do this a pipe less than 1 in. would be indicated and the resulting velocity be so great that the water of condensation could not flow back against the steam. This is an important consideration in designing a quiet and smoothly operating system. Where the water of condensation must flow back against the steam flow there are certain velocities in the various sized pipe that dare not be exceeded.

Table 15 gives the accepted velocities and capacities that may be used with safety. These values are less than what were obtained by actual test and were adopted as being the best practice to allow for initial heating and indifferent piping. It will thus be seen that if the first floor radiator were taken off the riser to the upper floors the size of the riser would need be at least of 2-in. pipe with scarcely any friction drop, and that this radiator would be fully heated when the boiler had attained a pressure of about 0.24 lb. pressure while the remote radiators remained cold. This has led to the long established practical rule of taking all first floor connections separately from the main. In this way the run will be longer and help conditions partially. If the system were originally designed so that there were but 1 oz. of pressure drop to the extreme end the difference in pressure between any two radiators would be less than this amount and could readily be rectified or entirely ignored.

TABLE 16

LENGTH IN FEET OF PIPE TO BE ADDED TO ACTUAL LENGTH OF RUN—DUE TO FITTINGS—TO OBTAIN EQUIVALENT LENGTH

SIZE OF PIPE INCHES	ST'D. ELBOW	SIDE OUTLET TEE	GATE VALVE	GLOBE VALVE	ANGLE VALVE
	Length in Feet to be Added in Run				
2	5	16	2	18	9
2½	7	20	3	25	12
3	10	26	3	33	16
3½	12	31	4	39	19
4	14	35	5	45	22
5	18	44	7	57	28
6	22	50	9	70	32
7	26	55	10	82	37
8	31	63	12	94	42
9	35	69	13	105	47
10	39	76	15	118	52
12	47	90	18	140	63
14	53	105	20	160	72

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Standard modern practice, therefore, tends toward restricting the pressure drop to about 2 oz. through the entire run for systems 200 ft. long with a corresponding increase for more extensive systems. In general, the drop in any system need not be over 4 oz. in all. This is about 1 oz. drop per 100 ft. of length and most tables giving capacities of pipes are based on this loss.

In Fig. 32 the loss in ounces is shown by the heavy horizontal lines which are of such material help that the piping can be sized at a glance. Thus in this layout it takes but a moment to note that the main should be of 3-in. pipe from the boiler to No. 3 riser and of 2-in. for the balance of the run.

The risers should be designed from Table 15 where a 2-in. riser is indicated to the first floor and that 1½ in. may be used for the upper floors. The entire pressure drop throughout the system will then be scarcely over 2 oz., the water in the drip from riser No. 5 be but 4 in. above the boiler water line, the extreme difference in pressure between any two radiators could scarcely be over 1 oz. and the system will operate smoothly, evenly and quietly.

When systems are designed for a large pressure drop as in the first instance and a high water column is needed in the return, another danger enters if a dry return is used. The return column to reach a height somewhat near the level of the branch to No. 5 riser must first fill all of the long run of return piping. Sometimes the capacity of this pipe is so

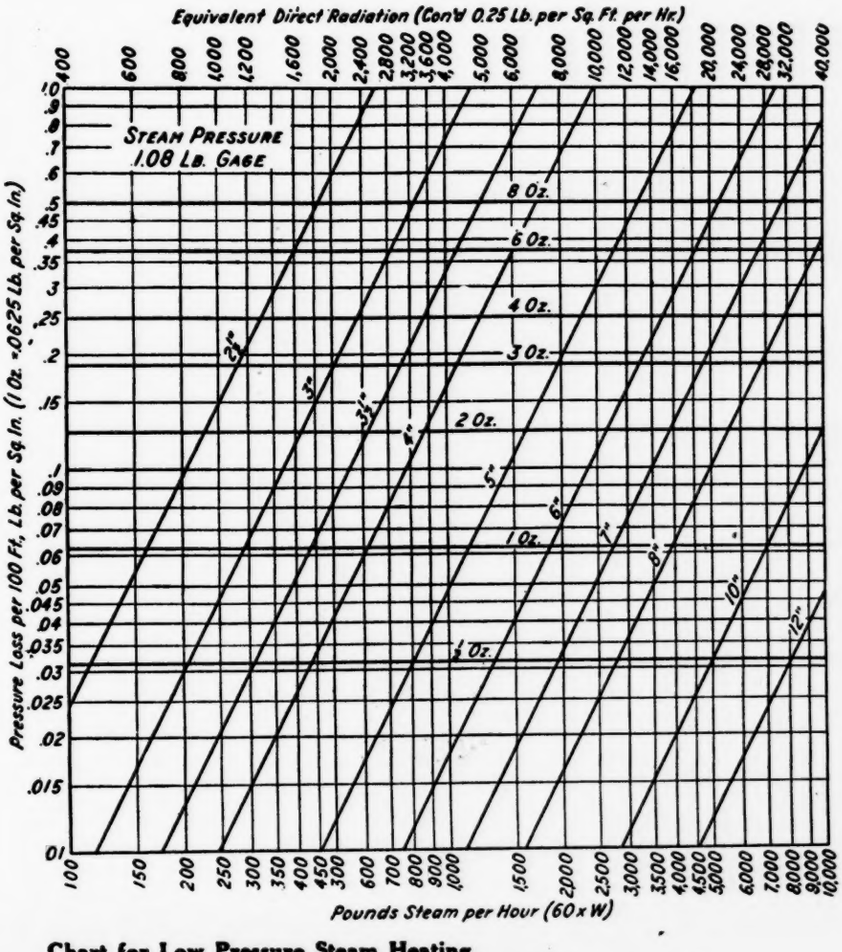

Equivalent Direct Radiation (Con'd 0.25 Lb. per Sq. Ft. per Hr.)
Steam Pressure 1.08 Lb. Gage
8 Oz.
6 Oz.
4 Oz.
3 Oz.
2 Oz.
1 Oz.
½ Oz.
Pressure Loss per 100 Ft. Lb. per Sq. In. (1 Oz. = .0625 Lb. per Sq. In.)
Pounds Steam per Hour (60 x W)

Chart for Low Pressure Steam Heating
Vol. I, by Harding and Willard, published by John Wiley & Sons, Inc.

great as to lower the water in the boiler below the gauge glass, but the level will return after the pressure in the boiler is lowered. This is often spoken of as siphoning, probably correctly so when no swing check valve is used in the return and the steam pressure in the boiler forces the water back through the return. The check valve, however, is not a cure, as the same condition will eventually exist due to the condensation being retained in the return until a proper height is obtained.

The connection shown at the return to the boiler and many times called the Hartford loop, is often used instead of a check valve, the return piping being raised and connected to the drip from the header at a point 2 or 3 in. below the level of the water carried in the boiler. This will prevent siphonage, for as soon as the water has fallen to a point below the level of the connection the drip from the header acts as an equalizing pipe, but in no case, as is so often supposed, will it prevent the water of condensation from being retained in the return piping.

It will be noticed in Fig. 31 that No. 3 riser is dripped and the main relieved at this point of the accumulated water of condensation. Some designers make it a rule to drip each riser, but this is hardly necessary except in the case of very high buildings. Another practical rule, and a safe one, is to relieve the system wherever the size of the main has been reduced, so that the reduced pipe is not still further restricted by the water of condensation. In all cases where a reduction is made, eccentric fittings should be used.

There is no reason why a one-pipe gravity system can not be adapted to any size building and when properly designed operate quietly and efficiently. Many are noisy but it is because some of the foregoing rules have been violated. Much noise is often noticed at the radiator and is generally due to a restricted valve. If a riser to a radiator is just sufficiently large to carry its radiation and the same size connection and valve are then used, the velocity of flow through the valve may be increased due to its restricted nature so that the allowable velocity is exceeded. This holds the water in the radiator and gurgling and water hammer result. This is also manifested when a valve is not fully closed when the radiator is intended to be shut off.

Atmospheric or vapor systems will be discussed in the next article.

Air Conditioning

***by* William Hull Stangle**

VI—Fans and Drives

IN the selection of a fan unit, the engineer must first determine the volume required and the static pressure necessary to provide the necessary outlet velocities and overcome the resistance of the distribution system. Outlet and inlet requirements, together with distribution system requirements, will be discussed in subsequent articles.

It has been stated that the demarcation between a fan and a centrifugal compressor is usually placed at one pound to the square inch. In practice, the usual pressures dealt with are from 2 to 3 oz. In fact, it is rare to use a fan for ventilation purposes for pressures over 2 oz. (3½ in. of water).

Three types of fans have been discussed.

1. The forward blade fan is illustrated in a modern type in Fig. 1.

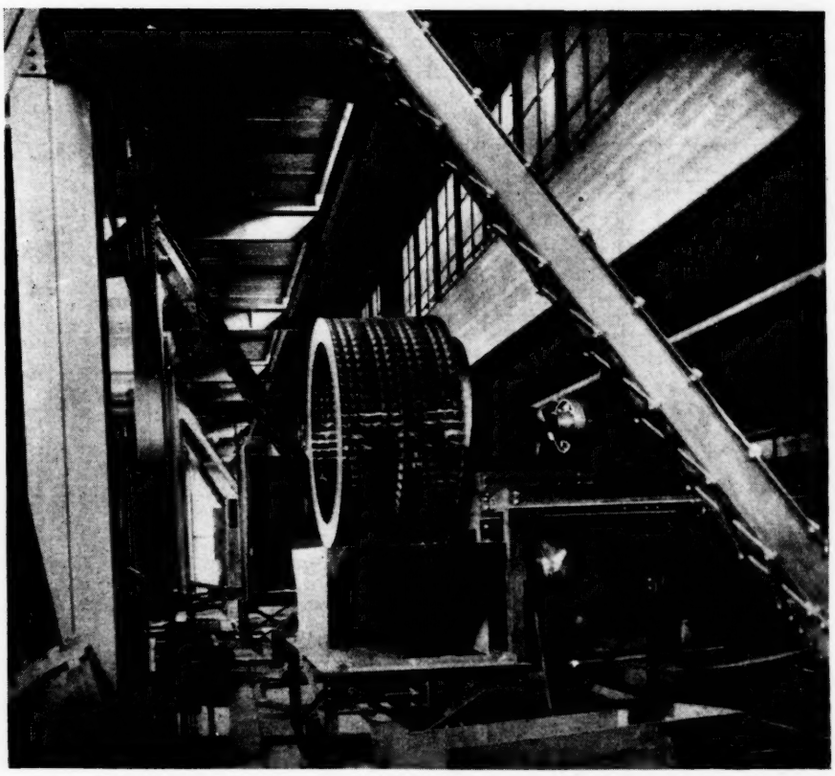


Fig. 1. Wheel of Forwardly-Curved Blade Fan

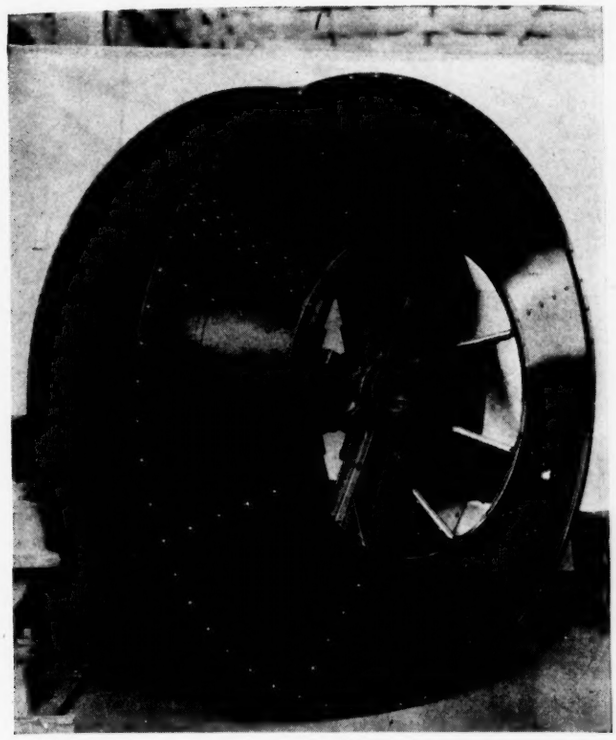


Fig. 2. Wheel of Radially-Curved Blade Fan

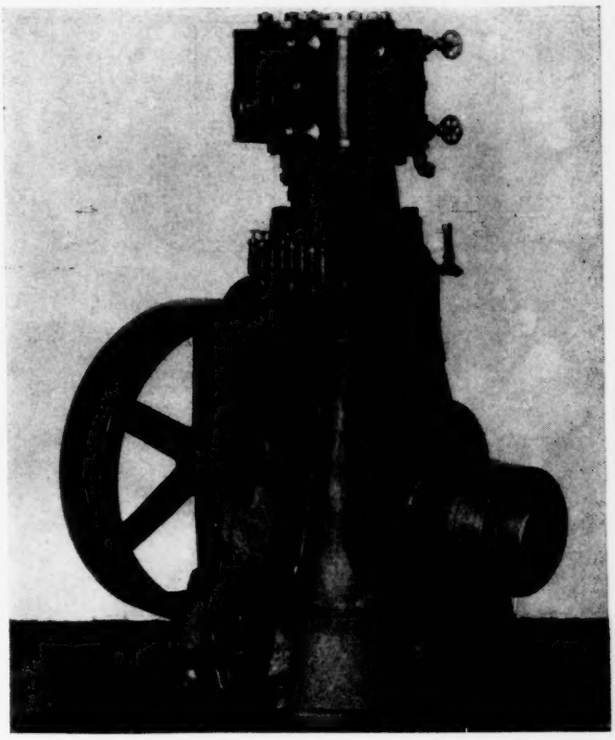


Fig. 3. Vertical Steam Engine Designed for Fan Drive

This fan requires less space and weighs less than the other two types. On an equal basis it is somewhat noisier, will not operate in parallel and is the least efficient. Further, it is the least expensive. It is a relatively slow speed machine. It operates best at tip speeds of from 2800 to 3400 r.p.m., giving from ⅝ in. to 1¼ in. static pressure. Its efficiency is 45% to 50%. The horsepower increases with increasing volume, requiring an oversized motor.

2. The radial blade or steel plate fan is illustrated in Fig. 2. This fan requires more space than the forward blade and less space than the backward blade fan. Its weight is in similar proportion. It operates very well in parallel. It is more efficient than the forward blade and less efficient than the backward blade fan. While an efficiency of 65% can be attained, the general practice is to rate it from 50 to 55% efficiency. It operates at tip speeds and pressures slightly higher than those of the forward blade fan. Horsepower requirements are not quite as stringent as in the forward blade fan, and as the characteristic curve shows, the leeway for oversize is less, since the static efficiency and horsepower drop off in proportion, whereas, in the forward blade type the horsepower continues to increase as the static efficiency decreases.

3. The backward blade fan is illustrated in a modern type by Fig. 7. This fan requires more space and weighs more than either the forward or radial blade fans. It is the most efficient type with efficiencies of 60% to 70%. Tip speeds up to 6000 r.p.m. may be obtained. This type fan requires a relatively lower horsepower and practically no oversize for the motor. Because of its high speed it is especially adapted to the most

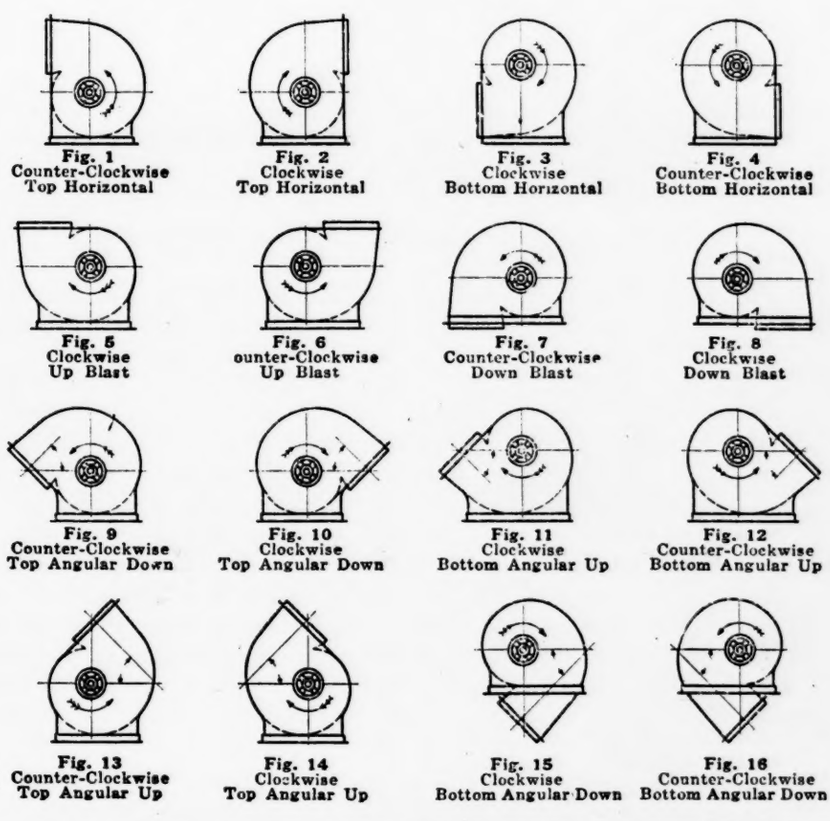


Fig. 4. Fan Designations As Adopted by the National Association of Fan Manufacturers

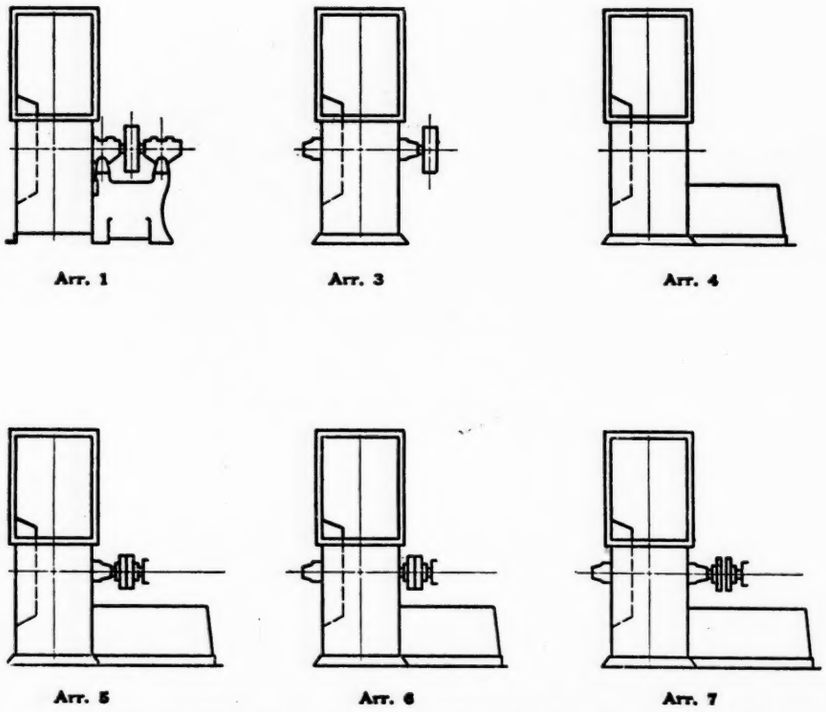


Fig. 5. Standard Fan Drives As Adopted by the National Association of Fan Manufacturers

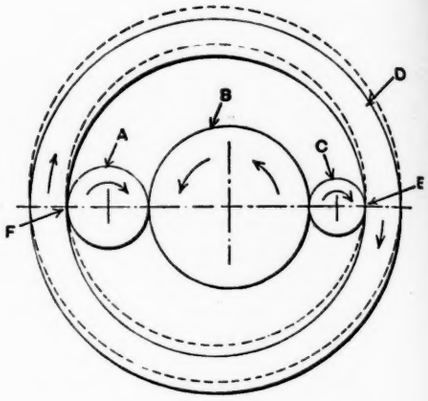


Fig. 6. Diagram Showing Action of Silent Gear

modern high speed motor drives. Naturally, it has the lowest power load, resulting in greater economy of operation. It is the most expensive of the three types of fans but the cost is partially reduced by the less expensive high speed motor.

Fans are designated by standards as adopted by the National Association of Fan Manufacturers. Fig. 4 shows the designations as adopted. Fig. 5 shows the standard arrangement of drives.

As an example, and in order to compare the relative merits of the three types of fans, let us assume a required volume of 25,000 c.f.m. and static pressures of 1 in., 1¼ in., 1½ in. and 2 in. Tables 1, 2 and 3 show respectively the forwardly-curved blade, the radially-curved blade, and backwardly-curved blade fans answering these requirements. These

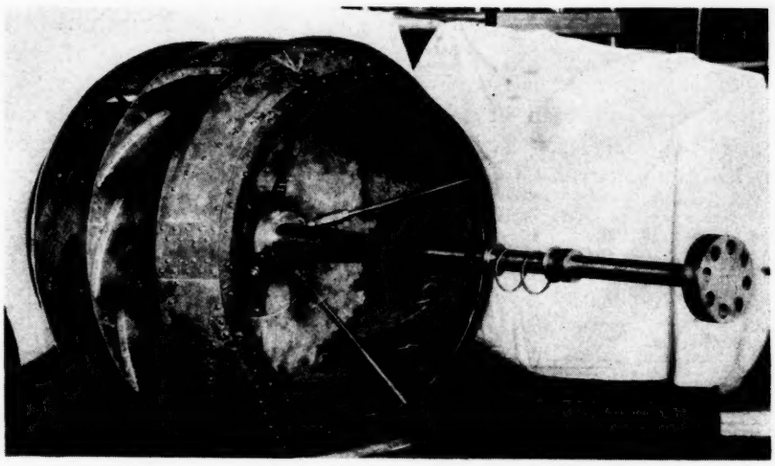


Fig. 7. Wheel of Backwardly-Curved Blade Fan

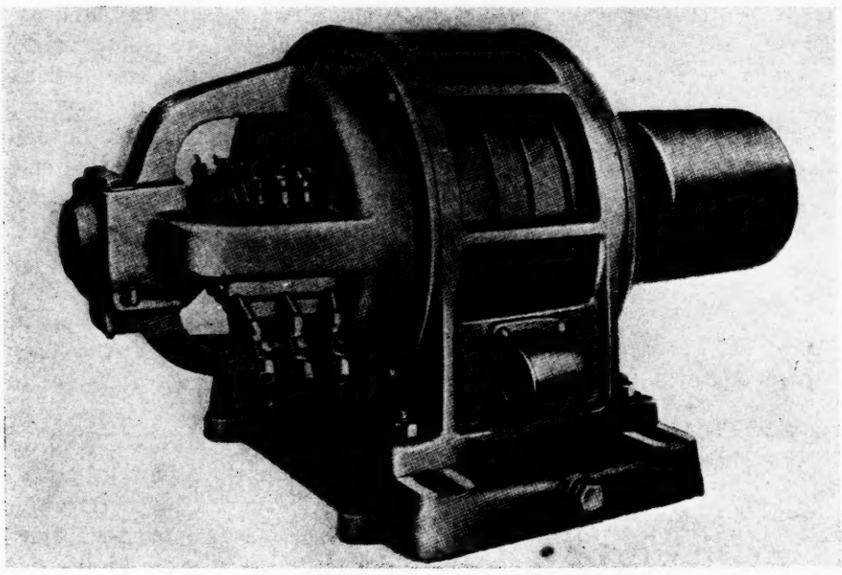


Fig. 8. A Modern Quiet-Operating Motor

fans have been selected from the standard designs of one of the prominent fan manufacturers. All fans selected are single width, single inlet.

It is to be noted that in practically all cases, with fixed volume, the horsepower requirement is in proportion to the static pressure requirement, and that the tip speed is also in similar proportion. The noise question generally is in proportion to tip speed. When the tip speed is higher than desirable a bigger wheel must be selected. The above figures clearly indicate the value of selecting a silent high speed backwardly-curved blade fan for air conditioning, particularly where noise nuisance is to be considered.

Fans may be driven by any form

of prime mover that will meet the requirements. However, economic factors control the selection of a drive as well as the desire for correct engineering design.

Where direct current is used, direct connection may be used. See Fig. 11. A prominent engineer, in the past, has used the tandem drive for both supply and exhaust fans, where direct coupling with d.c. motors was possible. See Fig. 12. This could be applied to gear, belt, chain or multibelt drive. However, the fine adjustment of speeds in modern requirements argues for individual drives.

Steam-driven units are still used under certain circumstances. See Fig. 3. They may be direct coupled or utilize a form of transmission.

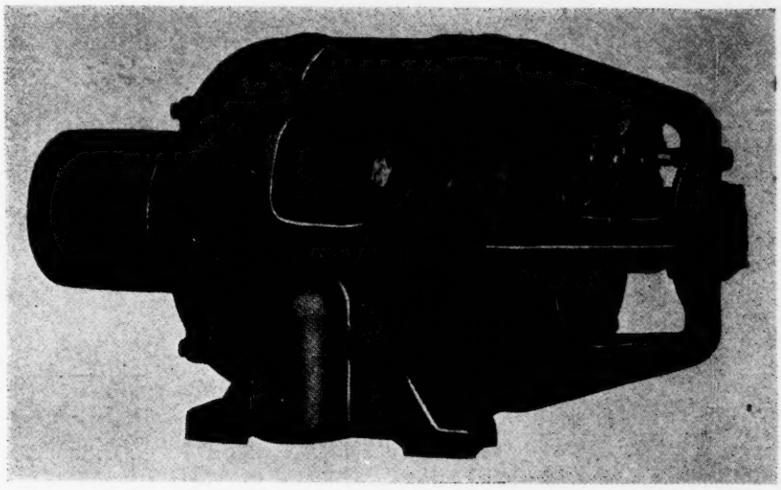


Fig. 9. Quiet-Operating Motor for Fan Drive

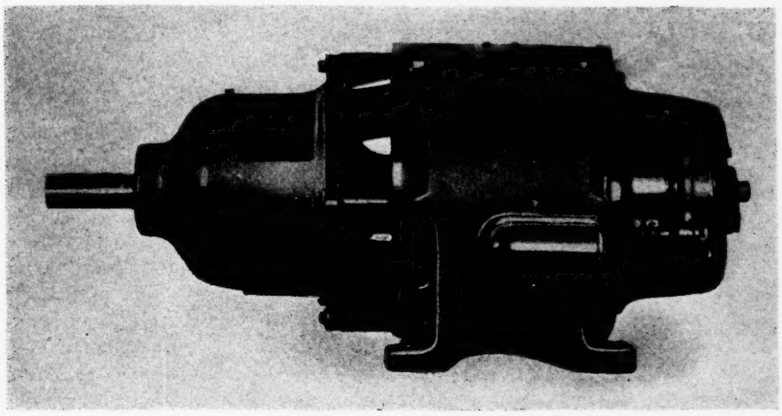


Fig. 10. Quiet-Operating Motor with Speed Reducer or Increaser

Where the speeds of driver and fan are not the same, a transmission drive must be instituted. This may be accomplished by gears, belt, chain drive or the multibelt drive. As a d.c. motor is naturally variable in speed it can usually be direct connected.

In the majority of instances, today, a.c. is the current serviced to most buildings. The most popular motor for modern drive is the slip ring variable speed a.c. motor. These motors are now designed at high speed operation with practically no noise nuisance and are highly efficient. The old time a.c. hum has been nearly eliminated, and careful design has reduced to a negligible quantity the various noises of the older motors. See Figs. 8, 9 and 10.

With the high speed fan and high speed motor with variable speed control and short multibelt drive, such as texrope or vacuum belting, the best results are obtained. See Fig. 13.

The principal point to keep in mind is to supply the proper amount of air at the correct static pressure and to have enough leeway in the apparatus and its design to be able to maintain the desired conditions, also, to offset minor corrections for design of the distribution system. Probably, the greatest fault in the design of a system is the failure to so balance the distribution as to obtain efficient fans at nominal pressure requirements that will deliver the correct volumes at correct velocities.

Fan, motor and drive manufacturers have all standardized units, and, when possible, it is well to endeavor to use such standard equipment, provided it is properly balanced and gives the desired result within economic limits. Any manufacturer will not hesitate to give full information regarding his product. The engineer's job is to sift and analyze the manufacturers' guarantees to find the best units for the job.

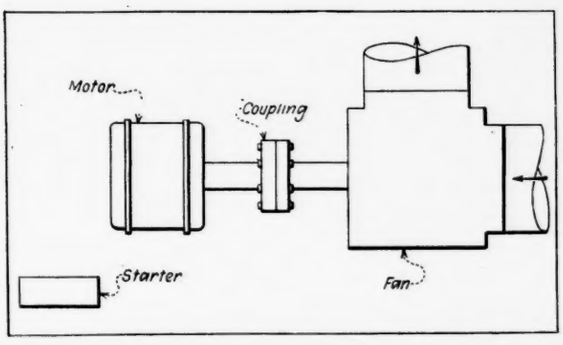


Fig. 11. Direct-Connected Fan Drive Much Used with D.C. Motors

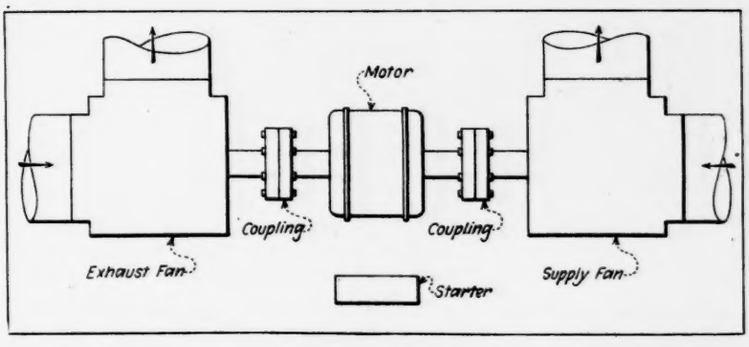


Fig. 12. Tandem Direct Drive Showing Two Fans Driven by a Single D.C. Motor

TABLE 1

Forwardly-Curved Blade Fans

C.F.M.	Static Pressure, In.	R.P.M.	Tip Speed	Brake Horse-power	Horse-power	Remarks
25,000	1	235	3200	7.5	10.0	Not too noisy
25,000	1¼	258	3500	11.0	15.0	Fairly noisy
25,000	1½	338	4000	11.6	15.0	Noisy
25,000	2	380	4500	15.0	20.0	Very noisy

TABLE 2

Radially-Curved Blade Fans

C.F.M.	Static Pressure, In.	R.P.M.	Tip Speed	Brake Horse-power	Horse-power	Remarks
25,000	1	180	4000	8.0	10.0	Ordinarily not too noisy
25,000	1¼	250	4700	11.0	15.0	Noisy
25,000	1½	210	4600	11.5	15.0	Noisy
25,000	2	290	5500	15.0	20.0	Very noisy

The tips of radially-curved blades are, in modern practice, tipped back slightly. This cuts down air noise but also reduces the volume about 10%.

TABLE 3

Backwardly-Curved Blade Fans

C.F.M.	Static Pressure, In.	R.P.M.	Tip Speed	Brake Horse-power	Horse-power	Remarks
25,000	1	375	5800	6.8	7.5	Very quiet
25,000	1¼	353	5800	7.7	10.0	Quiet
25,000	1½	342	5900	9.0	10.0	Quiet
25,000	2	387	6700	12.5	15.0	Requires careful installation

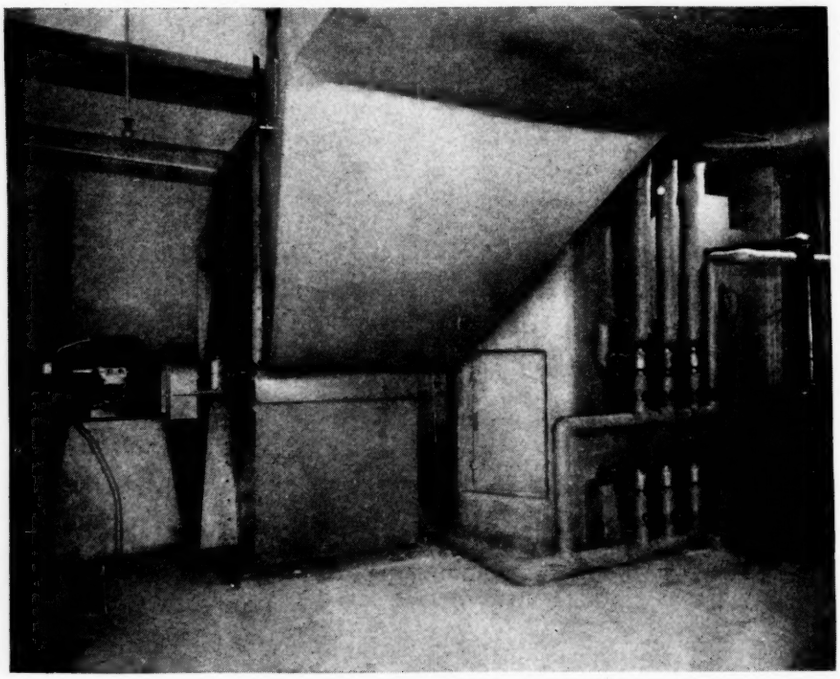


Fig. 13. Modern Installation Showing Motor, Drive and Fan. Stack Heaters and Piping are at the Right and the Motor Control Can Just Be Seen at Extreme Left

Another item of vital importance in the up-to-date installation, is sound proofing of foundations, fan-room walls, etc. This will be discussed in the special article on acoustical and heat insulation.

Ventilated Walls Reduce Heat Transfer

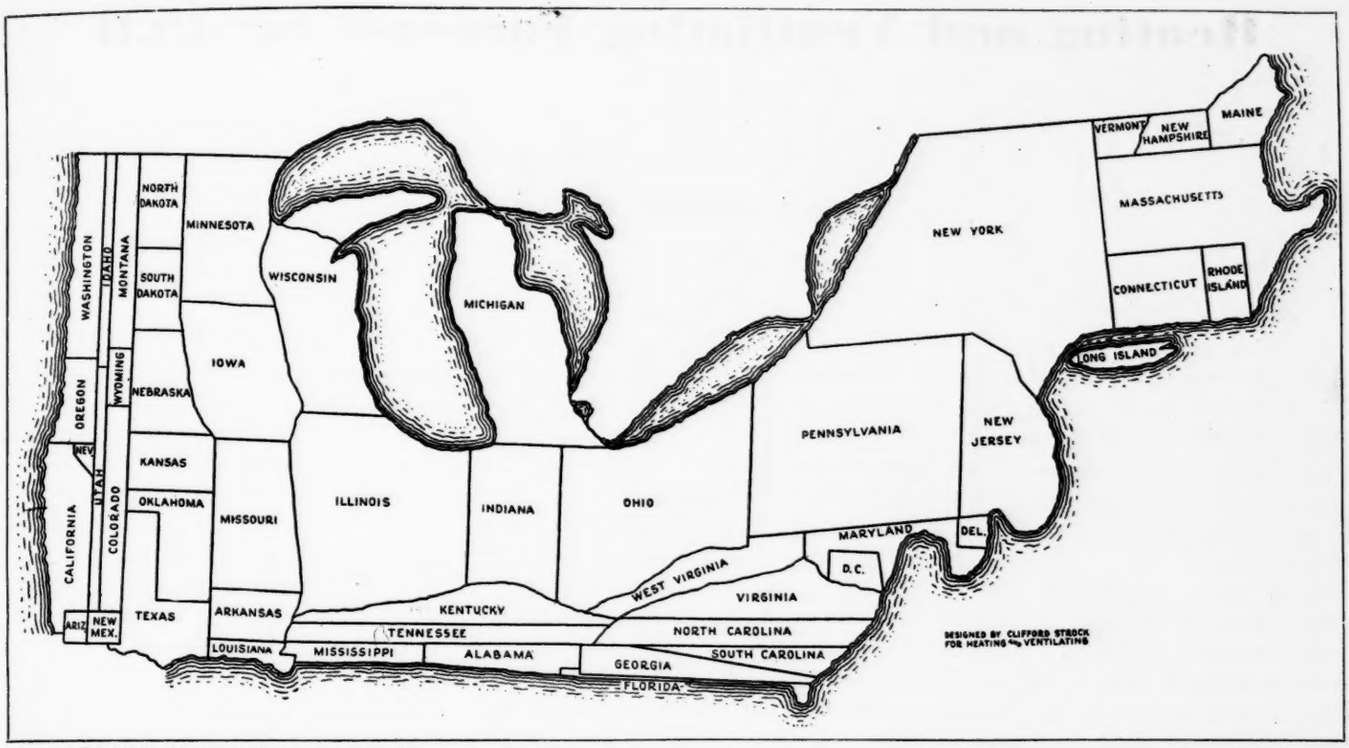
In a paper read before the Western Society of Engineers on September 8, 1930, entitled "Design of the World's Fair Buildings," by Clarence W. Farrier and Bert M. Thorud, the authors told how the walls of the buildings will be ventilated to reduce the heat transfer. Part of the paper follows:

Of course in the summer time, we have to consider the heat from the sun. Merely using the steel on the outside wall, the inside of the building, at least near the outside wall, would be quite unbearable due to the heat absorption of the steel. To partially offset that heat transmission, a sheet of insulation board is placed on the inside, which creates an air space between the steel and the inside walls, shut off by this insulation board, which in itself stops part of the heat transmission. Each one of these channels serves as a duct or flue running from the bottom of the building to the top. Each one of these steel sections on the building in the detailing of the building is ventilated at the top, which allows the air current as it rises to pass outside of the building, with a lip to prevent the driving rain coming into the top of the channel and spoiling the insulation board. These flues are open in a similar way at the bottom so that cool air is introduced at the bottom of each. As it is heated it rises and passes off into the outside air and greatly reduces the heat transmission from the outside steel to the inside board. This will serve to a large extent to remove the curse of the steel construction so far as hot weather and the extreme sunshine on the lake front are concerned.

House Construction Bulletin to Benefit Contractors and Builders

"Light Frame House Construction," is the title of a 200 page illustrated bulletin, prepared jointly by the National Committee on Wood Utilization of the Department of Commerce and the Federal Board for Vocational Education, now available for distribution.

Among other subjects the bulletin discusses the comparative values of insulating materials, and the air infiltration through different types of building paper. The publication may be obtained for 40 cents a copy from branch offices of the Department of Commerce, located in the principal cities, or from the Superintendent of Documents, Government Printing Office, Washington, D. C.



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HEATING DEMAND MAP OF THE UNITED STATES

Showing Relative Demand for Fuel for Heating of Buildings by States

THE accompanying map is distorted to show the relative importance of the states so far as the demand for fuel for the heating of buildings is concerned. That is, the areas of the states are in proportion to this heat demand rather than to their actual area in square miles.

The result is that New York, Pennsylvania, Illinois, Ohio, Michigan and Massachusetts occupy 45% of the total area of the map, showing that these states consume 45% of the total fuel of all kinds used for the heating of buildings.

The map was constructed as follows: The demand for heat is in direct proportion (approximately) to the number of degree days in the State, as explained in previous issues of HEATING AND VENTILATING. However, due to the size of the states, the degree day load at the north may be considerably higher than in the south, so that the degree day load was weighted. For example, Illinois was considered as having an average degree day load more nearly that of Chicago than at the middle of the State, due to the population being concentrated at the north. This load was multiplied by the product of the number of buildings and the population, so that the latter two combined had an equal weight with the degree day load. The result was then reduced to index numbers. The per cent of the total area occupied by each State is as follows:

New England States		
Maine	1.015	
New Hampshire	0.560	
Vermont	0.433	
Massachusetts	4.516	
Rhode Island	0.721	
Connecticut	1.687	
		8.932

Middle Atlantic States		
New York	12.744	
Pennsylvania	8.844	
New Jersey	3.468	
Delaware	0.194	
Maryland	1.232	
District of Columbia	0.422	
West Virginia	1.454	
		28.358

Southern States		
Virginia	1.836	
Tennessee	1.404	
North Carolina	1.592	
South Carolina	0.788	
Georgia	1.143	
Alabama	0.832	
Florida	0.189	
Mississippi	0.610	
Louisiana	0.399	
		8.793

Midwestern States		
Ohio	6.575	
Indiana	2.968	
Illinois	7.490	
Michigan	5.321	
Kentucky	1.787	
Wisconsin	3.862	
		28.003

North Central States		
Minnesota	3.778	
Iowa	2.713	
Kansas	1.137	
Missouri	2.780	
Nebraska	1.509	
North Dakota	0.999	
South Dakota	0.860	
		13.776

South Western States		
Arizona	0.172	
New Mexico	0.266	
Texas	1.853	
Oklahoma	1.476	
Arkansas	0.921	
		4.688

Western States		
California	1.748	
Nevada	0.078	
Oregon	0.760	
Washington	1.476	
Colorado	1.104	
Idaho	0.422	
Montana	1.015	
Wyoming	0.311	
Utah	0.538	
		7.452
		100.000

Heating and Ventilating Forecast for 1931

by **C. Stanley Taylor**

IN the forecast for 1930, published in the January Supplement of HEATING AND VENTILATING, 1930, it was stated that because of unusual economic developments there seemed to be no positive average opinion as to the amount of business which the heating and ventilating industry might have in the past year.

Events have shown the most unusual economic upset which this country has known for many years and it is news to no one that the anticipated volume of business did not materialize. The question now is—what will happen in 1931?

Any forecast is but an educated guess. The accuracy of a forecast is gauged in ratio to the number and types of sources employed to gain pertinent information. The quality of a forecast depends on how carefully past experience is employed in weighing its component parts.

The forecast as to heating and ventilating sales activity in 1931, which is made here, is based on something more than guesswork. The figures which are presented have been developed from a large number of contacts with architects and contractors.

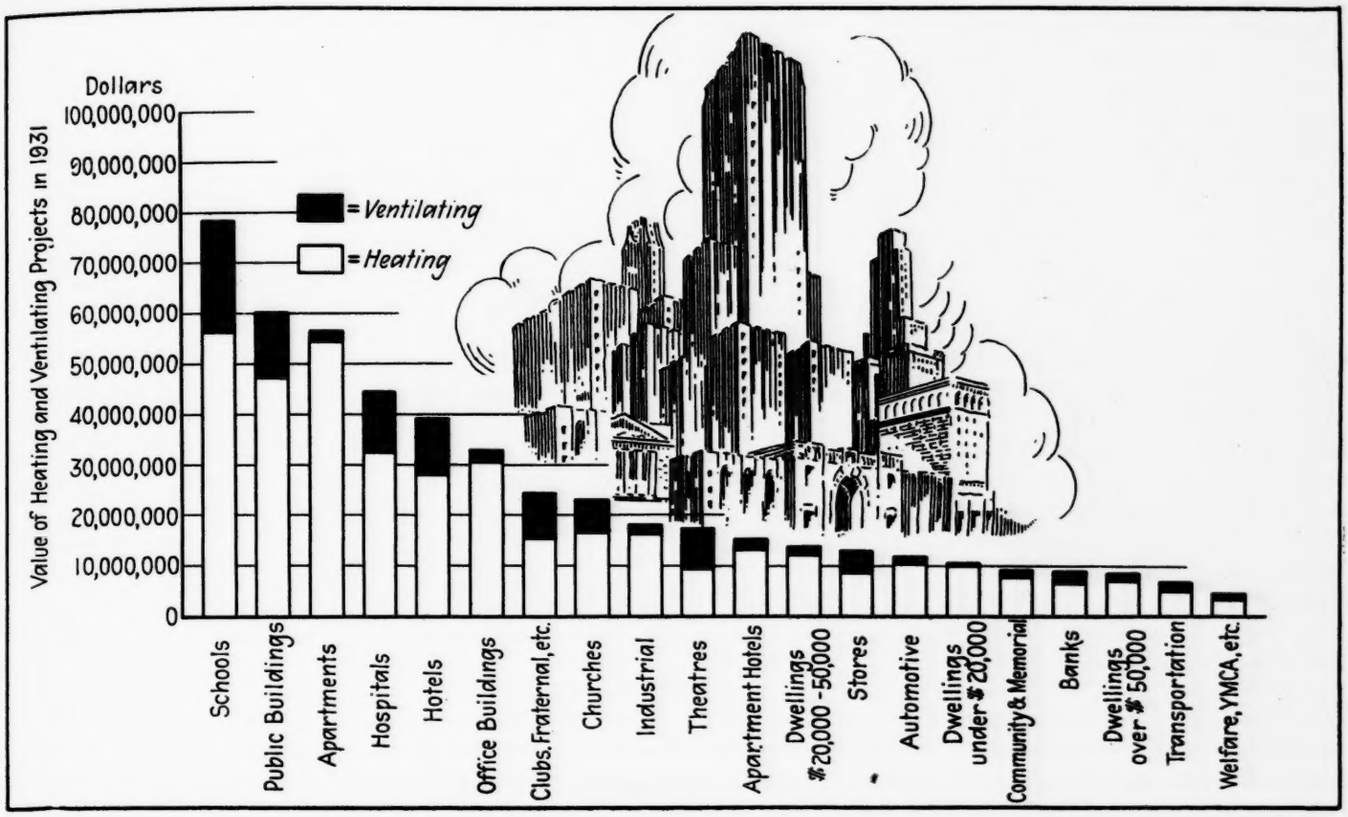
We have just completed the annual building forecast and, having developed this forecast of general building, the heating and ventilating forecast has been drawn off, using a series of carefully developed factors indicating the part played by heating and ventilating* products in total cost of various buildings. The building forecast is also based on opinions obtained from every source which seemed possible to us, including contractors, engineers and mortgage sources. In general, it indicates that building activity for 1931 will be approximately the same in volume as 1930 with the possibility of an upward turn due to government, state and city contracts, deliberately developed to ameliorate labor and general economic conditions.

The heating and ventilating industry is developing so rapidly that it is constantly taking a greater proportion of the money expended in building projects. There have been many interesting extensions of this industry during the past year, even to the development of windowless buildings, requiring maximum expenditures in controlled air conditions. There have been a number of developments along the more scientific lines of heating and ventilating in buildings of all types, particularly in the institution field. There have been unusual developments in industrial processes, all of which are tending to create greater markets for this industry.

The tabulation shown herewith indicates primarily the probable expenditures in heating and ventilating to be made in various types of buildings and various sections of the country for new construction developments from architect's plans. This tabulation does not include the great amount of business which will be obtained through the replacement and remodeling markets and also in those classes of buildings which do not come under the scope of the architect's plans, including at least

*Includes Air Conditioning.

	NORTHEASTERN STATES			NORTH ATLANTIC STATES			SOUTHEASTERN STATES		
Building Type	Building Value in Millions	For Heating	For Ventilating	Building Value in Millions	For Heating	For Ventilating	Building Value in Millions	For Heating	For Ventilating
Automotive	$9	$829,512	$138,100	$27	$2,422,485	$403,000	$1	$141,696	$23,620
Banks	4	441,500	166,300	31	3,347,000	1,261,000	.9	97,810	36,870
Apartments	18	1,940,000	91,500	299	31,776,000	1,498,000	6	680,000	32,100
Apartment Hotels	2	230,500	44,280	38	3,930,000	755,200	.6	72,500	13,940
Clubs, Fraternal, etc.	12	1,193,100	715,860	68	6,789,600	4,073,000	5	538,330	323,000
Community and Memorial	6	578,510	115,700	31	3,128,710	625,740	2	208,690	41,730
Churches	20	1,983,000	802,450	60	5,970,000	2,410,310	5	535,000	216,150
Dwellings (Below $20,000)	9	867,500	23,070	38	3,618,000	96,360	5	450,900	11,980
Dwellings ($20,000-$50,000)	10	1,232,000	205,330	35	4,160,000	692,570	5	662,000	110,290
Dwellings (Over $50,000)	6	625,000	130,380	24	2,340,000	487,490	6	575,000	119,720
Hotels	7	695,000	283,720	69	6,774,000	2,764,550	26	2,510,000	1,024,510
Hospitals	48	5,070,000	1,930,280	96	10,140,000	3,860,070	10	1,048,000	399,500
Industrial	11	755,000	106,390	108	7,680,000	1,082,240	4	304,500	42,930
Office Buildings	24	2,195,000	179,000	63	5,850,000	477,000	4	399,700	32,600
Public Buildings	19	2,128,000	575,760	224	24,920,000	6,738,060	7	791,000	213,770
Schools	63	6,418,000	2,512,970	169	17,310,000	6,787,300	16	1,685,000	660,100
Stores	5	452,000	240,670	25	2,353,000	1,251,520	2	228,000	121,360
Theatres	8	850,000	772,850	39	4,289,000	3,906,070	2	284,500	258,300
Transportation	2	175,400	58,420	38	3,393,000	1,131,600	1	97,700	32,590
Welfare	4	349,000	113,770	16	1,473,000	480,190	.2	18,860	6,150
Total Value	$287	$29,008,022	$9,206,800	$1,498	$151,663,795	$40,781,270	$108.7	$11,329,186	$3,721,210



Classification of the Value of Heating and Ventilating Projects for 20 Classes of Buildings for 1931

half of the industrial and public utility building throughout the United States.

The value of this tabulation is to indicate where and in what kinds of buildings the new markets for heating and ventilating will presumably occur. From the point of view of manufacturers this tabulation may, therefore, be taken as a general guide for sales and advertising activities and, from the point of view of engineers, heating contractors and others active in the industry, it will serve to give some indication as to where activities may be expected.

There are also shown with this article several charts and tabulations which, while fairly self-explanatory, will bear some comment.

The charts shown herewith include a graphic classification of the value of heating and ventilating projects for twenty types of buildings. This chart has been derived from the tabular material presented herewith and can be compared with the similar chart shown in the issue of January Supplement of HEATING AND VENTILATING, 1930, in order to obtain a quick impression of changes in potential activity for the field. There are also shown graphic charts

SOUTHWESTERN STATES			MIDDLE STATES			WESTERN STATES			
Building Value in Millions	For Heating	For Ventilating	Building Value in Millions	For Heating	For Ventilating	Building Value in Millions	For Heating	For Ventilating	Building Type
$12	$1,069,731	$178,400	$50	$4,510,287	$752,000	$13	$1,205,154	$201,000	..... Automotive
1	159,900	60,300	21	2,236,000	843,000	4	417,000	157,100	..... Banks
28	2,975,000	140,400	95	10,050,000	473,500	64	6,790,000	320,500	..... Apartments
19	1,956,000	375,150	45	4,678,000	898,880	22	2,327,000	447,150	..... Apartment Hotels
20	2,012,280	1,207,370	41	4,153,710	2,492,220	8	806,880	484,130	.....Clubs, Fraternal, etc.
5	471,500	94,300	11	1,128,730	225,750	22	2,229,990	445,000	.Community and Memorial
14	1,431,000	577,770	55	5,470,000	2,210,880	14	1,380,000	557,440	..... Churches
10	985,000	26,200	30	2,855,000	75,960	14	1,294,000	34,410	Dwellings (Below $20,000)
8	1,024,000	170,810	29	3,468,000	578,100	12	1,426,000	237,630	Dwellings ($20,000-$50,000)
6	610,900	127,350	19	1,865,000	388,680	12	1,143,000	238,210	..Dwellings (Over $50,000)
52	5,089,800	2,075,910	63	6,195,000	2,525,440	70	6,851,000	2,796,860	..... Hotels
31	3,290,000	1,253,780	99	10,370,000	3,949,120	23	2,416,000	920,370	..... Hospitals
11	763,500	107,500	59	4,220,000	594,130	32	2,268,000	319,510	..... Industrial
33	3,050,000	248,600	153	14,100,000	1,150,000	54	4,910,000	400,000	..... Office Buildings
19	2,160,000	584,000	131	14,530,000	3,926,770	25	2,786,000	752,140	..... Public Buildings
72	7,400,000	2,901,000	184	18,805,000	7,371,310	48	4,915,000	1,927,820	..... Schools
17	1,638,000	870,630	30	2,799,000	1,487,890	11	1,067,000	567,640	..... Stores
14	1,504,000	1,365,300	16	1,728,000	1,569,480	6	617,700	561,700	..... Theatres
3	298,700	99,630	8	710,000	236,770	3	286,800	92,250	..... Transportation
.6	56,600	18,450	9	792,000	258,180	6	578,500	188,800	..... Welfare
$375.6	$37,945,911	$12,482,850	$1,148	$114,663,727	$32,008,060	$463	$45,715,024	$11,649,660	..... Total Value

indicating relative activity in various sections of the country and a divisional chart of the United States showing the geographical division.

The additional tabular material shown herewith shows the apparent relative importance of large building types in the heating and ventilating markets of 1931. Comparing this forecast with that of last year we find some interesting changes. The largest market seems to lie in the school field as it did last year. The second field for 1931 seems to be public buildings instead of office buildings, as indicated last year. Office buildings as a market have moved down to sixth position instead of second. Apartment buildings hold third position as they did last year. Hospitals have moved forward to fourth position where hotels held that position last year and hotels in turn have moved to fifth position. In a similar manner comparisons can be made through the entire group of twenty building types.

The graphic charts showing geographical distribution of business show some interesting comparisons with last year as follows:

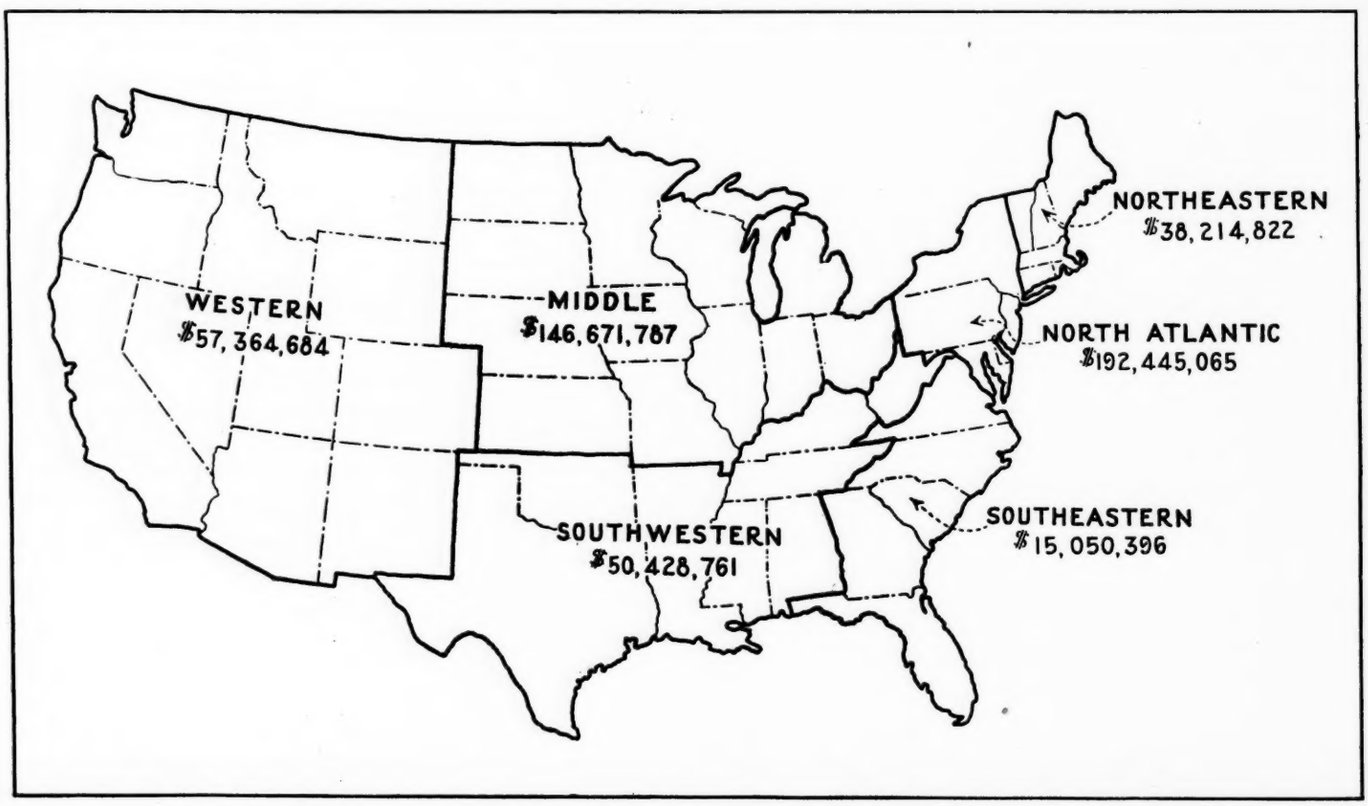
The market for heating is apparently to increase in the North Atlantic states and decrease somewhat in the Middle states. The West Coast and Southwest business is evidently to remain approximately the same, while the Northeastern states show some decrease. The greatest apparent decrease is to be in the Southeastern district.

In the ventilating business the North Atlantic states are apparently to show a considerable increase in activity while the Middle states show a decrease. In the Southwest interest seems to be about the same while in the Southeast it is to decrease. The Western states show a falling off of market possibilities.

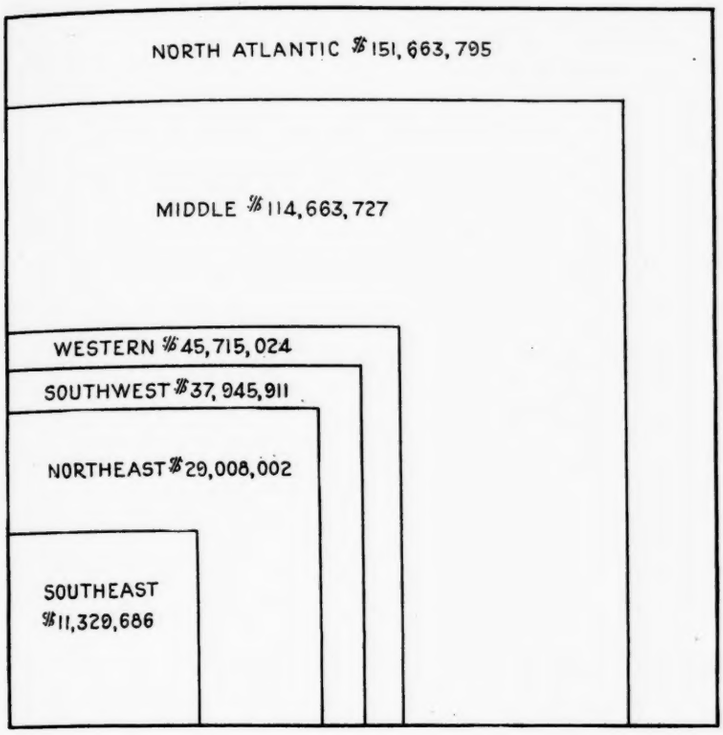
In addition to an apparent volume of business at least equal to that of 1930 there is another market which may add materially to total sales. This is the market of public financed buildings. In other words, the government, state, county and city pro-

HEATING AND VENTILATING MARKET DEMAND
BY BUILDING TYPES

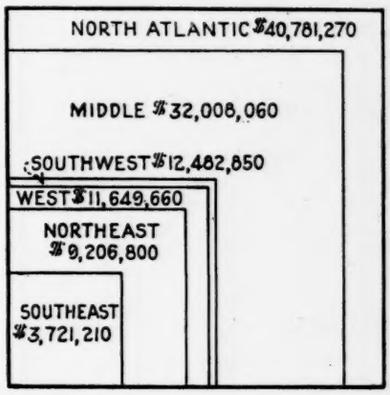
Type	Total Building Value in Millions	Heating	Ventilating	Heating and Ventilating Combined
Automotive	$113,098,500	$10,178,865	$1,696,120	$11,874,985
Apartments	511,548,800	54,211,000	2,556,000	56,767,000
Apartment Hotels	126,731,000	13,194,000	2,534,600	15,728,600
Banks	63,189,200	6,699,210	2,524,570	9,223,780
Clubs, Fraternal, etc.	154,939,000	15,493,900	9,295,580	24,789,480
Community and Memorial	77,461,300	7,746,130	1,548,220	9,294,350
Churches	169,375,100	16,769,000	6,775,000	23,544,000
Dwellings (Below $20,000)	107,194,500	10,070,400	267,980	10,338,380
Dwellings ($20,000-$50,000)	99,736,600	11,972,000	1,994,730	13,966,730
Dwellings (Over $50,000)	74,591,300	7,158,900	1,491,830	8,650,730
Hotels	286,774,500	28,114,800	11,470,990	39,585,790
Hospitals	307,828,000	32,334,000	12,313,120	44,647,120
Industrial	225,270,400	15,991,000	2,252,700	18,243,700
Office Buildings	331,993,400	30,504,700	2,487,200	32,991,900
Public Buildings	426,350,800	47,315,000	12,790,500	60,105,500
Schools	554,012,500	56,533,000	22,160,500	78,693,500
Stores	90,794,500	8,537,000	4,539,710	13,076,710
Theatres	84,337,000	9,273,200	8,433,700	17,706,900
Transportation	55,042,500	4,961,600	1,651,260	6,612,860
Welfare, Y. M. C. A., etc.	35,518,300	3,267,960	1,065,540	4,333,500
Totals	$3,895,787,200	$390,325,665	$109,849,850	$500,175,515



Value of Heating and Ventilating Projects for the Six Districts of the United States for 1931



How the Heating Projects (Left) and Ventilating Projects (Below) for 1931 will be Distributed. The Areas of the Charts Indicate the Relative Values of Heating and Ventilating



HEATING AND VENTILATING DEMAND BY DISTRICTS

Districts	Heating	%	Ventilating	%	Heating and Ventilating Combined	%
Northeastern ..	$29,008,022	7.44	$9,206,800	8.37	$38,214,822	7.65
North Atlantic.	151,663,795	38.85	40,781,270	37.10	192,445,065	38.48
Southeastern ..	11,329,186	2.90	3,721,210	3.38	15,050,396	3.01
Southwestern ..	37,945,911	9.73	12,482,850	11.35	50,428,761	10.09
Middle	114,663,727	29.36	32,008,060	29.20	146,671,787	29.30
Western	45,715,024	11.72	11,649,660	10.60	57,364,684	11.72
Totals	$390,325,665	100.00	$109,849,850	100.00	$500,175,515	100.00

HEATING AND VENTILATING DEMAND BY BUILDING TYPES

Type	Heating, %	Ventilating, %	Heating and Ventilating, %
Schools	14.51	20.25	15.70
Public Buildings	12.16	11.69	12.00
Apartments	13.91	2.33	11.36
Hospitals	8.28	11.10	8.93
Hotels	7.21	10.46	7.92
Office Buildings	7.72	2.26	6.61
Clubs, Fraternal, etc.	3.98	8.46	4.96
Churches	4.30	6.16	4.72
Industrial	4.10	2.05	3.63
Theatres	2.37	7.68	3.54
Apartment Hotels	3.39	2.31	3.15
Dwellings ($20M-$50M)	3.07	1.81	2.79
Stores	2.18	4.13	2.62
Automotive	2.61	1.54	2.38
Dwellings (Below $20M).....	2.56	.24	2.07
Community and Memorial.....	1.98	1.41	1.86
Banks	1.72	2.30	1.84
Dwellings (Over $50M).....	1.84	1.35	1.73
Transportation	1.27	1.50	1.32
Welfare, Y.M.C.A., etc.	.84	.97	.87
Totals	100.00	100.00	100.00

grams which are being deliberately developed. As this article is being written there comes an announcement from the White House to the effect that approximately $700,000,000 will be spent on building projects by the government in 1931. This is an increase of nearly $500,000,000 over the average government expenditure. In the referendum votes of the last election close to $500,000,000 was voted by various states for construction programs. Of this amount between $300,000,000 and $400,000,000 is for buildings.

For instance, in the city of New York alone $50,000,000 has been appropriated for institutional and public building work. It is quite possible that over $1,000,000,000 will be spent for new buildings through this unexpected channel—and all of these buildings require heating and ventilating equipment of the better type and involving unusually complete installations.

All factors considered it looks as though 1931 might be a reasonably good year for those manufacturers of heating and ventilating equipment who go after these markets in a forceful manner. 1931 is to be a year of real selling problems for this industry but it will have its rewards for those who really go after the business.

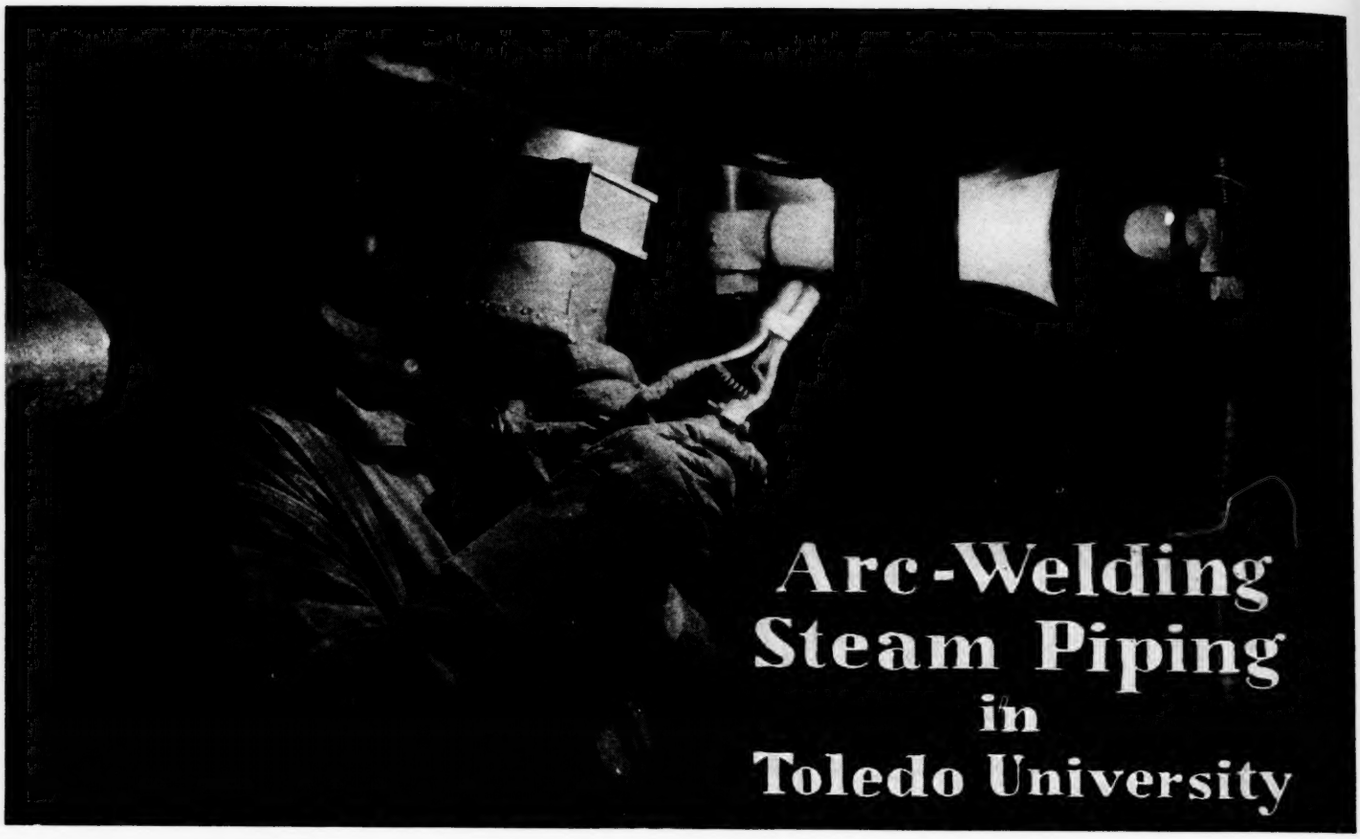


Fig. 1. Operator Arc Welding a Trap Into Place on a Steam Main

by* C. M. Taylor

FABRICATION of pipe lines for steam heating systems, such as those now being installed in the new Toledo University building, are an innovation in heating systems. In this installation there are several thousand feet of 2½ to 12 in. steam pipe, both for high and low-pressure steam distribution, and return lines, joined by the electric arc welding process.

Present plans for Toledo's new municipal university call for University Hall, a four story building for classrooms and administration quarters, and a gymnasium.

The Physical Education building, or gymnasium, also houses the power and heating equipment. From the boilers the steam is forced at high pressure through the gymnasium, thence through a tunnel to University Hall, in 10 in. pipes. Just before this pipe enters the tunnel an 8 in. line is taken off, reduced to low pressure and routed to the unit heaters in the gymnasium. It then goes through the tunnel and divides into two 6 in. lines for low-pressure distribution through the lower floors. All joints are arc-welded.

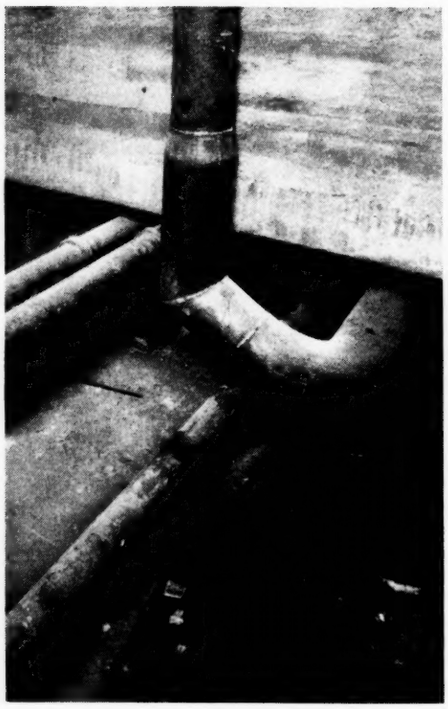


Fig. 2. All Sizes and Shapes are Possible by Use of Electric Arc Welding of Steam Lines. Note the Method of Making an Angular Turn

The 10 in. mains leading directly from the boilers are working under a pressure of 125 lb. per sq. in. These mains are tapped at intervals for distribution and the pressure reduced to 5 lb. The taps are made by cutting holes in the main as large as the diameter of the tap pipe and arc welding the pipe into place. One of the illustrations shows an operator welding a 4 in. pipe into the 10 in. main. This particular connection is a dirt trap for the high-pressure steam main. At the bottom of this piece of 4 in. pipe facilities for a screw cap make it easy to clean this trap regularly.

*Vice-President, The Lincoln Electric Company.

One of the advantages of electric arc welding of steam lines is the elimination of expensive reducing joints and take-off joints for distribution. Fig. 2 shows the method of reducing with this process, a reduction of a 12 in. line to a 10 in. one. The reduction is made by cutting V-shaped notches in the larger sized pipe and closing the edges of the notch for butt-welding as shown. The two sizes of pipe are then joined by arc welding the ends of the pipe sections together. The chief advantage of this type of reducing joint is that there is no place for the condensed steam to collect. The water is driven right through the pipe to a water or dirt trap. In the upper right hand corner of this photograph the method of taking off a small line is shown.

Another reducing joint and several types of turns are shown in Fig. 3. It shows where the 10 in. main rises from a lower tunnel to the basement, the reduction being from 10 in. to 8 in. pipe. The corner turns are made by welding regular tube turns into the line. The angular turns are made by cutting off sections of the ends at an angle and butt-welding them together. The small pipe in the left foreground is 6 in. low-pressure steam pipe.

The pipe head of an expansion loop is shown in Fig. 4. The head is made by cutting a piece of steel plate to size and arc welding it into place in the end of the pipe section. The 6 in. line to the left of the head is a high-pressure line. Part of an expansion joint on the line is shown at the extreme left of the illustration, while in the center on this same line a steel rest is arc welded to the pipe and rests on a roller to allow for expansion. The small pipe just below the head of the expansion loop is a return pipe.

Fig. 3. Arc Welded Steam Pipes Eliminate Expensive Reducing Joints

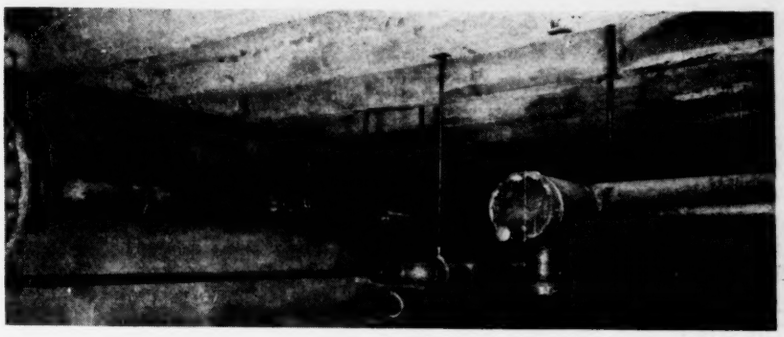


Fig. 4. An Expansion Loop Head Arc Welded. Note the Method of Connecting Pipe of the Same Diameter

The buildings were designed by Mills, Rhines, Bellman & Nordhoff, architects of Toledo. The Henry J. Spieker Company, was the general contractor, while the heating contract and pipe welding was sub-let to N. S. Larsen, of Toledo.

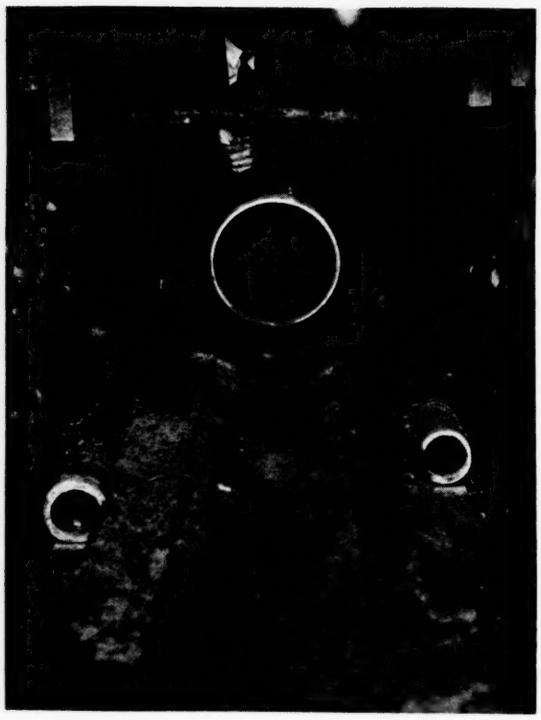
Loss of Light Due to Smoke in New York

A REPORT recently issued by the United States Public Health Service describes in an interesting manner a study of the loss of light due to smoke on Manhattan Island, New York, during the year 1927, especially in its relation to the nature of the weather, relative humidity and velocity and direction of wind.

A favorable opportunity for study offered itself in New York since simultaneous records of daylight could be conveniently made on the roof of the United States Marine Hospital at 67 Hudson Street, at the lower end of Manhattan Island, where the air was unusually smoky, and on the roof of a building at the United States Quarantine Station on Hoffman Island in lower New York Bay, about 9 miles south of the hospital, where the air was comparatively clear. The instruments consisted of photoelectric cells and recording potentiometers.

The photoelectric cell was placed on the roof of the building where the study was to be made and the recording potentiometer was placed in a convenient position within the building. The platform was of such height that no shadows were cast upon the cell at any season of the year, and was also so constructed that the cell was accessible, so that its glass surface could be kept clean.

It was found that, other conditions being the same, the average percentage loss of light was greater for cloudy days, or cloudy hours, than for clear days, or clear hours; the percentage loss being about 1.5 times as great for cloudy days as for clear days for relative humidities between 40 and 80% and for wind velocities between 10.0 and 19.9 miles per hr. For the same kind of sky, clear or cloudy, the average percentage loss of light increased with increase of relative humidity. For a clear sky the average percentage loss was twice as great for a relative humidity of 65% as for 35%. For a cloudy sky the increase with relative humidity was not as great. The percentage loss of light decreased as wind velocity increased.



Twelve-Inch Steel Steam Pipe, Concrete Slab and Two Drain Lines on Either Side, being Laid to Connect the Steam Plants of the Puget Sound Power and Light Co., Seattle

Two District Steam Lines Joined in Seattle

by **R. B. Johnston**

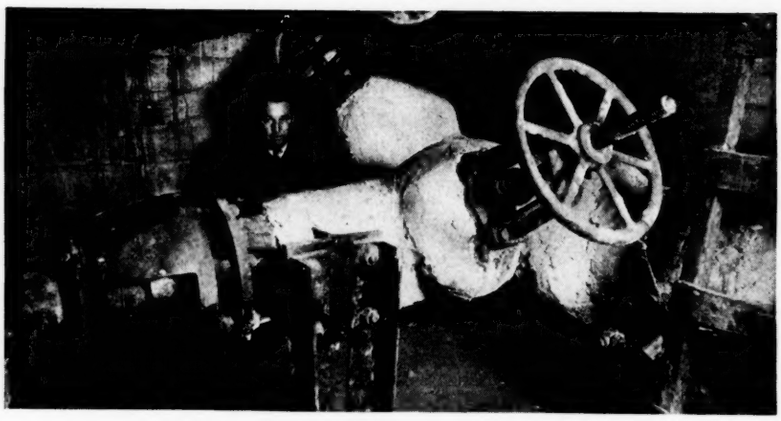
THE tying together of the two steam plants of the Puget Sound Power & Light Company in Seattle so that the combined volume of 510,000 lb. per hr. is made available to either north or south districts of the city has been accomplished.

The pipe line cost approximately $50,000. It is 2000 ft. long and required 60 workmen over two months to build.

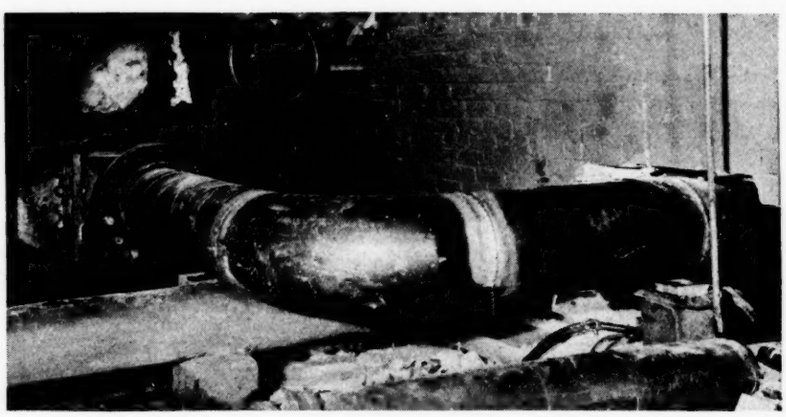
The tie-line unites the Western Avenue and Post Street steam stations of the company. It is a 12 in. full weight seamless steel pipe, welded in place at the joints. Expansion joints are placed every 300 ft. to allow for a 6 in. movement. They are fastened by flanged joints.

In the trench is placed a 6 in. x 24 in. concrete slab. Below the slab on both sides are 4-in. drain tile. On this slab rests a 2¾ in. concrete conduit with a 21 in. interior. Conduit sections were placed in halves and cemented. Inside the conduit the pipe, with a wrapping of 2 in. sponge felt insulation, is surrounded with a 2 in. air space. Rollers are placed at 9 ft. intervals and provide for the movement of the pipe due to expansion and contraction, which amounts to 6 in. 300 ft.

The felt insulation is in 3 ft. lengths. The joints are staggered and sealed by cementing heavy waterproof paper over them.



Gate Valve and Expansion Joint in a Feeder from the New Connecting Line



Welded Joints and Fabricated Fittings in Line Attached to the Main Header

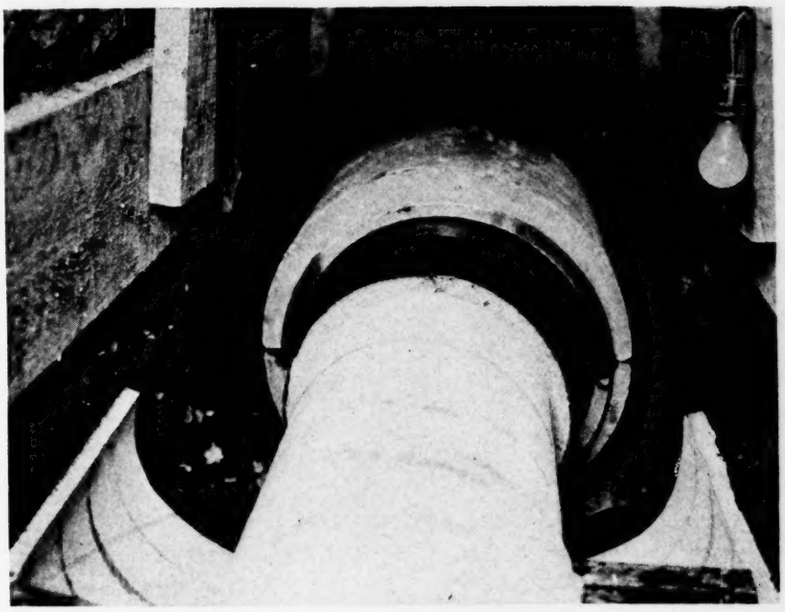
Thus the two district heating plants of the company are made one, after having operated without connection for nearly 30 years. A guarantee of uninterrupted service to the business and industrial districts is thereby made possible, it is declared by A. L. Pollard, superintendent of the steam division of the company. Should failure occur with one plant the other is available, and should demand increase more rapidly in one section than another the increase can be taken care of by the combined plants, he pointed out.

Seattle is the ninth city of the country in the amount of steam sold by district plants. In 1929 the total was 828,280,000 lb. For 1930 a substantial increase is expected, and there is forecast for 1931 a gain of about 30,000,000 lb.

In addition to low pressure steam for space heating the company also furnishes high pressure steam to industrial plants. The low pressure steam is delivered at 5 lb. and 228°, while high pressure is delivered at 100 lb. and 338°.

The trend toward use of district plant steam for space heating has been pronounced in Seattle. The company became engaged in the business by acquisition of two steam plants built to furnish power for the generation of electricity and later converted them to the production of steam for sale.

Use of central district steam for water heating in summer is becoming a worthwhile load factor. During July and August, 1930, more than 22,000,000 lb. of steam a month were sold.



Steam Pipe Encased by Sponge Felt and Wrap Insulation Inside the Concrete Conduit

Walter F. Geoghegan

Walter F. Geoghegan, vice-president and treasurer of the firm of Gillis & Geoghegan, Inc., died on November 10, 1930.

Mr. Geoghegan was a son of Stephen J. Geoghegan, a pioneer in the heating and ventilating business in New York. He was born in New York in 1877 and attended the College of the City of New York. He graduated in 1899 and entered the employ of Gillis & Geoghegan, Inc.

Mr. Geoghegan served as a director and treasurer of the Heating and Piping Contractors New York City Association in 1929 and 1930. He is survived by his wife and three daughters.

Frank Dobson

Frank Dobson, of the Frank Dobson Company, died on November 15.

Mr. Dobson served as vice-president of the Heating and Piping Contractors New York City Association in 1904 and 1905 and as president in 1906. He was also president of the New York State Association.

Robert J. Gross

Robert J. Gross, for many years prominent in the heating industry, died on November 21 at Dunkirk, N. Y.

In 1890 Mr. Gross organized the United States Radiator Company and was its president until 1910, when he brought about the merger of his company with the United States Heater Co., Detroit; the United States Radiator and Boiler Co., Pittsburgh; the Herendeen Mfg. Co., Geneva, N. Y., and the heating department of the J. L. Mott Iron Works, New York. Becoming president of the consolidation, which is the United States Radiator Corp., Detroit, Mich., Mr. Gross remained president of the corporation for several years, then retired and became a member of its board of directors, the office he held at the time of his death.

Standards Committee Discusses Pipe Sizes and Radiation Estimating

A meeting of the Committee on Standards of the Heating and Piping Contractors National Association was held at the headquarters of the association in New York, on November 17. The committee discussed pipe sizes for atmospheric steam jobs, hot water piping, extension of the association's base temperature and exposure factor studies to other cities, approval of several standards and heat losses through floors in buildings without basements.

The committee recommended to the American Society of Mechanical Engineers that 25 lb. pressure fittings be clearly marked to avoid any confusion with those designed for 125 lb. pressure. The committee concurred in the findings of various committees studying standards for wrought iron pipe nipples, steel base fittings and pipe plugs and voted to recommend to the board of directors the adoption of the proposed standards by the association.

Ralph S. Franklin outlined to the committee his belief that the base temperature and exposure factor studies should be extended to other cities, stating his belief that the 36 major cities where figures are now available are not inclusive enough. The committee agreed that studies leading to an addition to the standards are desirable and plan to do this in the comparatively near future. Another subject of importance was that of standards for hot water piping, no definite action being taken by the committee. It was felt after some discussion that co-operative tests of radiator condensation should be made with the A.S.H.V.E.

George P. Nachman was named as a sub-committee of one to prepare data on floor losses in buildings without basements, with a view toward a report back to the full committee at a later date.

Those present included Ralph S. Franklin, Charles E. Crone, Jr., George P. Nachman, Ray L. Spitzley, R. A. Wolff, W. H. Oleson.

Erratum

The article by H. M. Nobis appearing in the September School Reference Number of HEATING AND VENTILATING should have been entitled "Practice in East Cleveland" and not "Practice in Cleveland."

Ventilation System of the Asama Maru

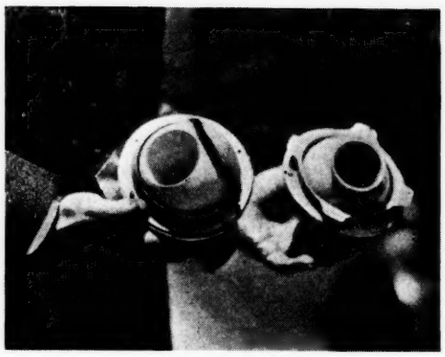
Asama Maru Arriving at Dock at San Francisco

WHEN the N. Y. K. motor liner Asama Maru arrived in the port of San Francisco recently, it marked a new epoch in trans-Pacific shipping. This vessel is the first of six great motor-driven liners built by Nippon Yusen Kaisha for the Pacific Coast-Orient Service at a cost of over $40,000,000. Luxury, speed and safety, the trinity of perfection in modern ocean liners, are the outstanding features of these latest trans-Pacific passenger vessels.

Sailing, as these vessels do on their regular schedule, from California ports to Hongkong via Honolulu and Japan, practically every variety of climate is encountered during the course of the year. Even in summer the range is from temperate California to semi-tropic Hawaii, then to Japan which is farther north than San Francisco, across to Shanghai and down to Hongkong, which again is in the tropics.

Under many of the climatic conditions encountered the windows must be kept closed and stateroom ports must be shut. In cool weather heat must be supplied to staterooms and public rooms.

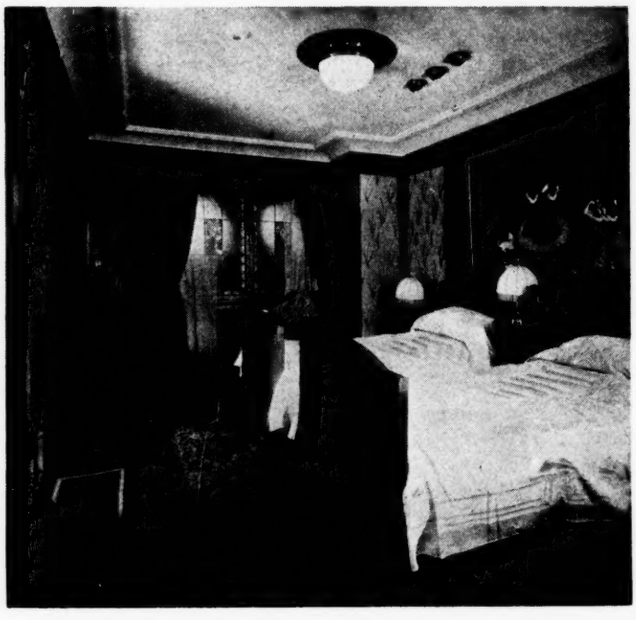
To provide this constant ventilation, an elaborate method of air supply, known as the Thermotank Punkah System, has been installed. This system is of English design and is of sufficient capacity to change the air throughout the vessel every few minutes. It comprises a system of air ducts extending to all cabins and passenger and public rooms through which air is blown or withdrawn continuously. In addition, staterooms are equipped with electric heaters and electric fans.



Details of Thermotank Punkah Air Nozzle

Unusual ingenuity is shown in the design of the air inlets of the Thermotank Punkah System. Each outlet consists of a cylindrical pipe passing through the center of a spherical device which in turn moves in a socket very much like an eyeball. As shown in the accompanying illustration, the device appearing at the right shows the outlet bottom up, while the unit at the left is held so as to show the outlet together with the lip, which makes it possible to regulate the flow of air from the nozzle. By moving the nozzle so that the opening in the sphere is under this lip, no air can pass through the inlet.

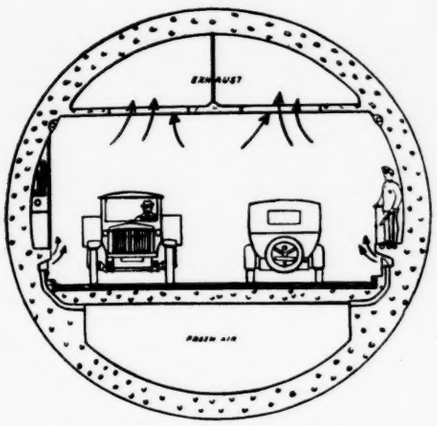
One of the notable features of the system is that it enables the occupant to regulate the ventilation to suit himself by moving the nozzle with his hand. In case the ceiling is too high for the occupant to reach the nozzle, a stick is provided which is inserted in the 2-in. opening of the nozzle, enabling the occupant to move it to any position desired. The opening can be turned to direct the flow of air either straight down or to any other part of the stateroom.



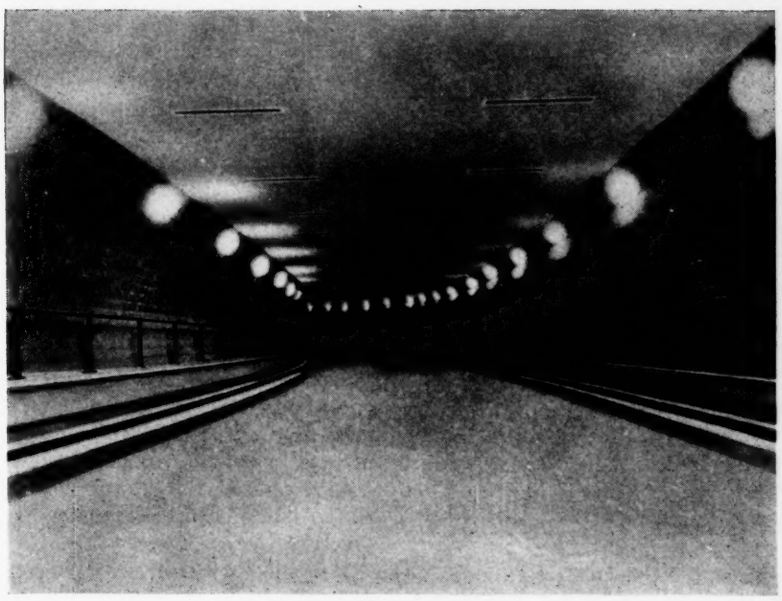
Electric Heaters and Air Outlets in De Luxe Suite, Asama Maru

First International Traffic Tunnel Opened

by **Ray S. Wood**



Cross-Section of Detroit Tunnel



View of Interior of the New $25,000,000 Detroit-Windsor Tunnel

THE first international sub-aqueous tunnel in the world, located under the Detroit River, connecting Detroit, Michigan and Windsor, Ontario, was officially opened to traffic at midnight, November 2, 1930.

Sixty years ago the citizens of Detroit were much wrought up over a debate which was then raging about the relative merits of a bridge and tunnel at this point. The railroads favored a bridge. Shipping interests, however, insisted that such a structure would constitute a hazard to navigation, and as such, should be prohibited. The exceedingly high masts of the sailing vessels then plying the Detroit River aggravated a problem. A bridge built high enough to clear these masts, it was found, would require approaches a mile long at each end to keep the grade down to the limited hill climbing ability of the locomotive. Attention, accordingly was directed to the tunnel project for swift transportation across the river.

In 1871, ground was broken near the foot of St. Antoine Street, for a tunnel under the Detroit River. It was to have a 15 ft. bore surrounded by masonry. A pocket of sulphurous gas entered the project when workmen were 125 ft. out under the river. The gas made the men so sick that none of them could be induced to resume work on the following day, neither could others be employed, and the project accordingly was abandoned.

Detroit's second tunnel venture took place in 1871 when a tube was projected to connect Grosse Isle, an island in the Detroit River, with the Canadian mainland. No gas was encountered here, yet this undertaking, too, had to be abandoned. The reason lay in certain limestone formations which sent the cost of excavation up to prohibitive heights. This tube likewise was abandoned.

The new Detroit and Canada tunnel, which cost approximately $25,000,000, is one mile long from portal to portal. The roadway in the tunnel is 22 ft. wide, allowing one lane of traffic in each direction, and an extra lane. This permits of the removal, both quickly and safely, of disabled automobiles. Traffic will be so regulated that despite the fairly high rate of speed, driving in the tunnel will be safer than surface driving in the surrounding streets. The estimated capacity is 1000 vehicles an hour in each direction.

One of the most elaborate ventilation systems ever devised has been installed in the tunnel. Two ventilation towers

(Continued on page 100)

STATISTICAL COMPARISON OF AMERICAN TRAFFIC TUNNELS

Name	Time to Complete, Months	Type of Construction	Length, Ft.	Diameter, Ft.	Width of Road, Ft.	Number of Fans	Total Air Capacity Per Min., Cu. Ft.	Total Hp.	Type of Drive
Detroit-Windsor	30	Shield driven and steel pipes sunk in place, reinforced with concrete on both sides	5,845	31	22 and 28	24	1,500,000	1,466	Silent Chain
Geo. A. Posey	40	Precast reinforced concrete sections sunk and boring..	4,436	38	22	16	1,000,000	1,200	Silent Chain
Holland	36	Boring	9,250	32	22	84	3,761,000	6,333	Silent Chain

Fig. 1. Welded Offset to Pass Peep Hole

Welding Ventilating Ducts

ONE of the important uses for the oxy-acetylene process in the sheet metal field is the fabrication of welded sheet metal piping for the transmission of air. Many large industrial plants have complete systems of oxwelded air ducts for ventilating systems, blast pipes for furnaces, blower piping for forge shops, exhaust piping for dust removal, vent ducts and warm-air heating systems. Oxy-acetylene welded sheet metal piping has been found most suitable for any of these purposes.

The tightness of the oxwelded joint assures freedom from leakage and increases the life of the system. With the use of oxwelding, less metal is required because of the elimination of overlapping sections and of complicated fittings, which are difficult to construct with other types of seams. The making of the joints is just a matter of welding together pieces of sheet metal.

Many factory and office buildings are so large that the systems of air ducts total thousands of feet. Ventilation of blower systems operate either by force or by suction, and fans are used to create the pressure or suction as the case may be. Any leakage in the system would therefore be serious from an economical point of view as it would mean a constant loss of power. Systems of this type are in use in many plants for the removal of fumes, products of combustion, or flammable dust, where the reliability of welded joints is an obvious necessity.

Another advantage resulting from the use of the oxwelded joint is that of corrosion resistance. An oxy-acetylene weld made with the proper welding rod will outlast the sheet metal, and there are no seams to act as starting points for corrosion.

Most of the large installations of systems of this type have been made by sheet metal contractors, who were experienced in using the oxy-acetylene process for making sheet metal joints. In large forge plants, an efficient blower system with piping for the air supply is of particular importance. Fig. 2 shows two temporary compressors supplying air during the construction work on a new central forge plant. It will be noted that the joints on the bend in the sheet metal pipe are all fabricated by oxy-acetylene welding. Oxwelded construction makes it possible to lead in new branches to the main header by simply cutting out the proper shaped opening with a cutting blowpipe and welding in the branch connection. In the illustration, a 30-in. diameter sheet metal pipe extending through the roof supplies the air to the compressors which discharge into the 20-in. main at the right.

Fig. 3 shows a general view of the interior of one of the 70-ft. x 600-ft. buildings which compose the forge plant. Along both sides and the end of the building is a line of 20-in. welded pipe

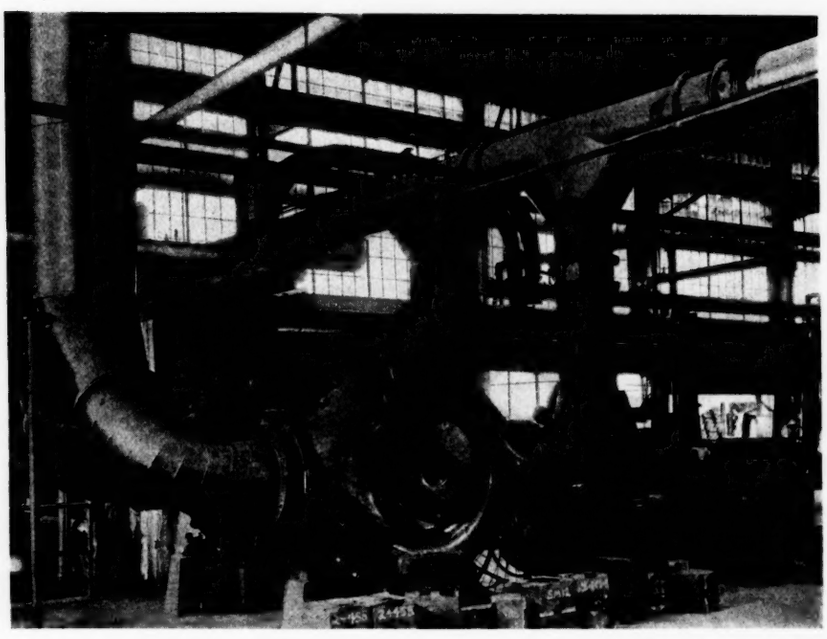


Fig. 2. Two Compressors with Oxy-Acetylene Welded Sheet Metal Duct Connections

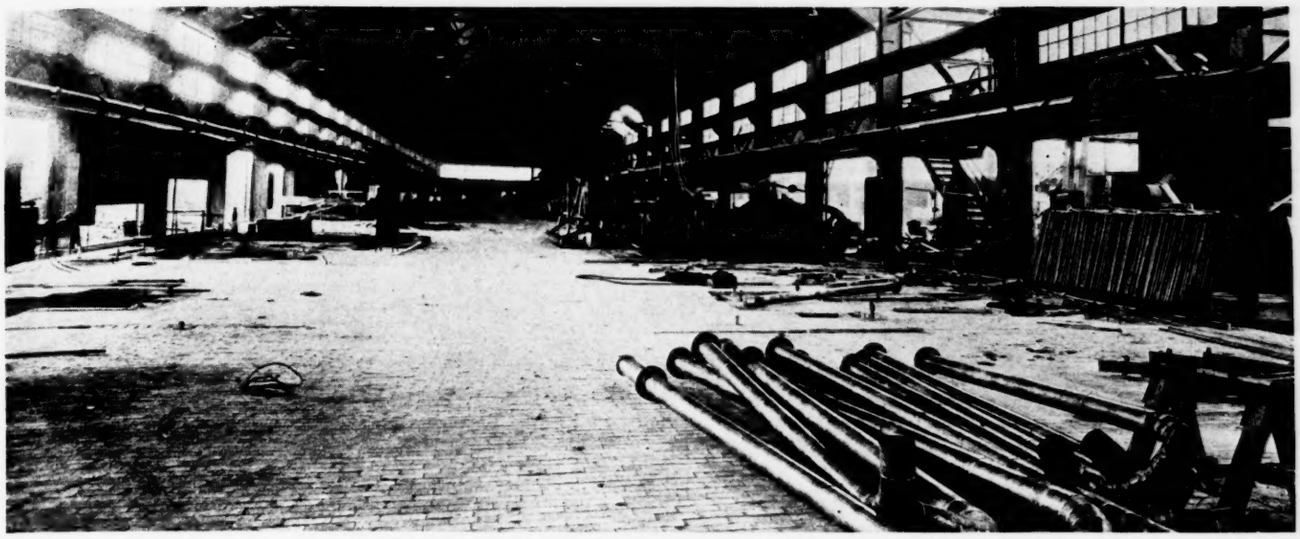


Fig. 3. Air Piping System Extends Around Whole Plant

which is the air main, from which lines 4-in. to 8-in. in diameter supply the various furnaces. Between the two buildings which compose the forge plant, four compressors are mounted on a bridge and a 36-in. oxwelded line supplies the air to the two 20-in. mains.

Oxwelding facilitates the fabrication of offsets to avoid obstructions or places where it is impossible to run the pipe. Fig. 1, which shows the piping connections to a single furnace clearly, illustrates the use of an offset, which in this case is to dodge a peep hole in the side of the furnace. The use of oxwelded sheet metal piping is a convincing proof of the value of a system of this type for forced draft, ventilation, warm-air heating, and similar installations.

—*Oxy-Acetylene Tips.*

Santa Fe Railroad Has Air-Conditioned Diner

As part of the equipment of the "Chief," one of the Santa Fe de luxe trains, this railroad has had built a large sized diner which is equipped with an air conditioning system.

A certain amount of outside air is admitted to the car through air filters located at the roof line. Dust, cinders and foreign matter are removed from the air by means of mechanical filtration and the air cooled to the desired temperature by passing over cooling coils, after which it is delivered through a system of overhead insulated ducts and distributed throughout the car.

This is accomplished without drafts, and the cool dehumidified air delivered through louvers placed in the halfdeck on each side of the car. The air is recirculated and supplemented by a certain amount of outside air, depending upon atmospheric conditions. Facilities have been provided whereby the person in charge of the car or train may control all of the conditions. Experience indicates that during very warm weather most comfortable conditions will obtain when the temperature within the car is about ten to fifteen degrees below the outside temperature.

There is a motor-driven refrigeration unit beneath the car floor which chills the water used in the cooling system to the desired temperature. Chilled water is then circulated by means of a motor-driven pump to the cooling coils located overhead at the pantry end of the car. The water is then returned to the evaporator where it is again cooled and is ready for recirculation.

Water used in the condenser is delivered by a motor driven pump to a "cooling tower" or "spray unit" at the end opposite the kitchen where fresh air, drawn from the outside, is passed through the water spray, and thus the temperature of the condenser cooling water is brought back to approximately that of the outside air, after which the water is available for recirculation.

The temperature at which the conditioned air is distributed and delivered through the overhead louvers in the car is dependent upon the chilled water in the cooling coils. This, in turn, is automatically regulated to suit conditions by a pressure control valve in connection with the compressor system.

Should the temperature of the cooling water tend to become too low, which might result in uncomfortably low air temperatures in the car or freezing of the water in the evaporator, the automatic control cuts off the refrigeration, thus automatically preventing a further lowering of the temperature.

In addition to controlling the temperature, the relative humidity will be controlled within certain limits, depending upon outside atmospheric conditions and the inside temperature.

The car is equipped with double-sash windows which will be kept closed all the time. Doors will also be closed, except as required for entrance and exit of passengers or train crew.

At lay-over points the air conditioning equipment will be put in operation sufficiently in advance of placing the car in a train for service so that comfortable temperature will be had when the train leaves, especially during warm weather. After the train reaches proper speed the air conditioning equipment automatically begins operation and is so controlled throughout the trip in accordance with requirements. While standing at stations or operating at speeds below the required point the air conditioning equipment shuts off, and when the train speed rises again to a set point it automatically resumes operation. Under ordinary conditions the time the equipment is not functioning because of low speeds, or while standing at stations, is so small a percentage of the total time, it is calculated that even during the warmest weather comfortable conditions will be maintained.

Exhaust air may be discharged to the outside or returned to the apparatus at the will of the engineer. On days when outdoor conditions are either extremely hot or cold this will effect a considerable saving.

American Society of Heating and Ventilating Engineers

Pittsburgh Prepares Program for 37th Annual Meeting

UNDER the leadership of H. Lee Moore, general chairman of the arrangements committee for the Pittsburgh chapter, plans have progressed rapidly for the 37th Annual Meeting of the A.S.H.V.E., to be held at the William Penn Hotel, January 26-29.

The meeting will be called to order by President L. A. Harding, at 2 P.M. Monday, January 26, at the William Penn Hotel, and on each day thereafter technical sessions will be held. On Wednesday all scheduled events will be transferred to the A.S.H.V.E. Research Laboratory at the U. S. Bureau of Mines Experiment Station where a technical program will be given in the morning. The afternoon will be devoted to inspection.

In addition to the program of technical papers, consideration will be given to several codes which have been developed during the past year. Two, which have already been reported to the Council, are the Code on Oil Burning Devices and the Code for Testing and Rating Concealed Gravity Type Radiation.

In Pittsburgh are located some of the world's most famed plants and among them are several that produce heating and ventilating equipment. The local committee is prepared to make arrangements for members who desire to visit plants such as Armstrong Cork, Byers, National Tube, Westinghouse, or any others specified.

Chairmen of the various committees arranging for the meeting are: H. L. Moore, general committee on arrangements; H. B. Orr, reception committee; F. C. Houghten, program committee; R. B. Stanger, entertainment committee; F. A. Gunther, banquet committee; W. W. Stevenson, transportation committee; J. E. McGinness, publicity committee; F. C. McIntosh, finance committee.

Registration begins at 9 a.m. on Monday, January 26, at the William Penn Hotel.

The complete program follows:

TECHNICAL PROGRAM

First Session, Monday, January 26

2:00 p.m. Greeting
Response—President L. A. Harding
Report of Council
Report of Secretary
Progress of Heating and Ventilating during the Past Quarter Century, by R. P. Bolton
Developments in Heating and Ventilating during 1930, by S. R. Lewis
Heating Effect of Radiators, by R. V. Frost
Committee on Code for Testing and Rating Concealed Gravity Type Radiation, by R. N. Trane, Chairman
Report of Tellers

Second Session, Tuesday, January 27

9:30 a.m. Report of Publication Committee—Prof. G. L. Larson
Report of Guide Publication Committee—D. S. Boyden
Development of the Ventilation System of the Holland Tunnel, by A. C. Davis
Noise Reduction in Ventilating Units, by Warren Ewald
Noise and Ventilation, by G. T. Stanton
Some Studies on the Absorption of Noise in Ventilating Ducts, by G. L Larson and R. F. Norris
Report of Membership Committee —John D. Cassell
Report of Increase of Membership —C. W. Farrar

Third Session, Tuesday, January 29

2:00 p.m. Report of Finance Committee —F. C. McIntosh
Air Conditioning as Applied to Furniture, Fixtures and Other Interior Woodwork, by D. R. Brewster
Air Conditioning in the Bakery, by W. L. Fleisher
Air Conditioning for Railway Cars, by A. H. Candee
Committee on Oil Burning Devices, by L. E. Seeley, Chairman

Fourth Session, Wednesday, January 28

9:30 a.m. Report of Research Committee—Prof. F. B. Rowley, chairman
Report of the Research Director—F. C. Houghten
Air Leakage through Various Forms of Building Construction, by F. C. Houghten, Carl Gutberlet and C. A. Herbert
Capacity of Return Mains for Steam and Vapor Heating Systems, by F. C. Houghten and Carl Gutberlet
Welded Piping for Building Heating Systems, by F. G. Outcalt
Air Pollution from the Engineers' Standpoint, by H. B. Mellor
Smoke and Dust Abatement, by M. D. Engle

Wednesday, January 28

2:00 p.m. Inspection Trip — Research Laboratory

Fifth Session, Thursday, January 29

9:30 a.m. Special Distribution of the Energy Radiated from Metallic Surfaces at High Temperatures, by G. R. Greenslade
Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces, by L. W. Schad
Wind Velocities and Temperature Gradient Near Surfaces, by F. C. Houghten and Paul McDermott

Sixth Session, Thursday, January, 29

2:00 p.m. Utilization of Hot Springs for Heating in Iceland, by Ben Grondal
Off-Peak System of Electric Heating, by Elliott Harrington
Heating with Exhaust Steam, by Perry West
Installation of Officers
Announcement of Rules of Award for F. P. Anderson Medal
Resolutions
Adjournment
4:30 p.m. Council Meeting (Organization of 1931 Council)

ENTERTAINMENT

Monday, January 26

12:30 p.m. Luncheon for Council and Authors
9:00 p.m. A Night in Pirate Hall (William Penn Hotel)
Westinghouse Program
Music, Cards, Dancing, Buffet Supper

Tuesday, January 27

8:00 a.m. Breakfast Meeting—Committee on Research
11:00 a.m. Breakfast Bridge for Ladies
6:30 p.m. Annual Dinner Past President Dinner for Wives of Past Presidents
8:30 p.m. Miniature Championship Golf Tournament for Miniature Research Cup (William Penn Miniature Course)

Wednesday, January 28

11:00 a.m. Sightseeing Trip for Ladies Lunch at H. J. Heinz Co. Plant
7:30 p.m. Annual Banquet and Dance—Urban Room, William Penn Hotel

Thursday, January 29

11:00 a.m. Shopping trip at Kaufman's Luncheon for Ladies

Illinois Chapter Discusses Stokers

At the regular monthly meeting of the Illinois Chapter, November 10, Joseph Harrington, the speaker of the evening, gave an interesting discussion on stokers and their part in smoke abatement and fuel economy.

D. D. Kimball of New York was a guest and was asked to extend the greetings of the chapter to the New York Chapter.

Dr. F. C. Honnold, secretary of the Illinois Coal Bureau, presented an interesting summary of the smoke abatement ordinance, and described the work being carried on by the coal bureau.

Manufacture of Wrought Iron Described at Buffalo Meeting

The principal speaker at the November meeting of the Western New York Chapter, held November 10th, was Dr. James Aston, Director of Mining and Metallurgy at the Carnegie Institute of Technology, and consulting metallurgist for the A. M. Byers Company. Dr. Aston is the inventor of the Aston process of wrought iron manufacture, and his lecture covered that development.

With slides and motion pictures illustrating the various steps of the process, Dr. Aston held closely the attention of the assemblage. The description of the new $12,000,000 plant of the A. M. Byers Company at Harmony Township, Pa., devoted entirely to the manufacture of wrought iron pipe by the Aston process, was comprehensive and interesting.

About 70 members and guests attended the dinner, and 30 more attended the meeting.

Illinois Chapter Addressed on Subject of Heating Guarantees

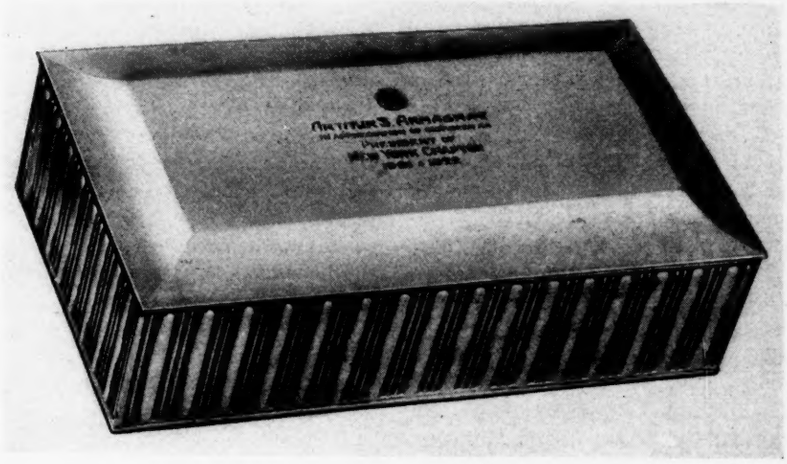
J. M. Robb, director of service of the Herman Nelson Corporation, was the speaker of the evening at the December meeting of the Illinois Chapter. Mr. Robb stated that the practice of the heating contractor in giving an unlimited guarantee on the heating plant confuses the channels of authority and obscures recognition of the purchaser's share of the responsibility for the heating results that he expects from his purchase. In Mr. Robb's opinion, proper heating diagnosis will hasten the time when the heating contractor will no longer be burdened with the responsibility that is, in reality, the joint load of the designer and the purchaser.

H. G. Thomas read the report of the committee on the investigation of the feasibility of establishing a better relations commission. The committee report recommended that the chairman of the committee be given the power to draft a letter over the president's signature inviting the Sheet Metal Contractors Association, the Master Steamfitters Association, the Illinois Society of Architects, and the consulting engineers to meet with the society committee for the purpose of discussing the organization of the commission. It was also suggested that a letter be addressed to the president of the A.S.H.V.E., calling his attention to a movement in various cities to create a building congress, or a similar organization, in which the president is respectfully requested to bring before the council for discussion the desirability of a standing committee to guide the society, in order that the organization may properly cooperate in this movement.

Lester Koetz was elected to membership in the chapter.

Past Presidents Honored by New York Chapter

Past presidents of the New York Chapter were honor guests at the chapter's November Meeting, held November 17, at the Building Trades Club, New York. Each one was presented with an engraved silver cigar box, bearing the inscription "(Name) In Appreciation of Services as President of New York Chapter (date)." The list includes: D. D. Kimball, 1913-14, W. H. Driscoll, 1915-16, Arthur Ritter, 1916-17, P. H. Seward, 1918-19, Perry West, 1919-20, W. L. Fleisher, 1920-21, A. S. Armagnac, 1921-22, W. H. Carrier, 1922-23, W. L. Durand, 1923-24, William J. Olvany, 1924-25, A. A. Adler, 1925-26, R. H. Carpenter, 1926-27, R. A. Wolff, 1927-28, H. B. Hedges, 1928-29, E. J. Ritchie, 1929-30. National President L. A. Harding, who was the honor guest of the meeting, made the presentation, and Frank G. McCann, as dean of the past presidents, made the response.



One of the Tokens of Appreciation Presented to Past Presidents of the New York Chapter

In connection with the proposed New York Building Code, President A. J. Offner announced the following committee to represent the chapter at the hearings: L. T. M. Ralston, chairman, representing the consulting engineers, H. B. Hedges, representing the manufacturers, and W. H. McKiever, representing the heating contractors.

Secretary Swain reported a total of 228 members. Those whose elections were announced at the meeting are Gustav B. Olsen, Clifford Strock, Walter G. Bancroft, and John S. Webb.

For the membership committee, President C. W. Farrar listed what he termed "ten spots" where the society can secure new members. These are:

1. Student members from universities and colleges.
2. Fellow engineers.
3. Men in architects' offices, where the specification writers are interested in heating and ventilating.
4. Salesmen selling heating and ventilating apparatus.
5. Industrial engineers in factories. These men are usually in control of the heating, ventilating and air conditioning of the building in their unit, and should be members of the society.
6. City employees—especially those interested in school heating and ventilating work.
7. Every building custodian, especially men in charge of schools and large office buildings.
8. The department head in a jobbing house who has in his charge the selling of heating and ventilating apparatus.
9. Engineers located in the small towns who may be not only interested in the profession of heating and ventilating, but also in warm-air heating.
10. Professors in colleges and universities interested in giving instruction to the student body on heating and ventilating apparatus.

Following the business meeting, President Harding presented his illustrated talk on "Utilization of the Sun's Energy," while Director F. B. Houghten of the A.S.H.V.E. Research Laboratory spoke on the subject of "Effect of Solar Radiation on Heating and Air Conditioning Problems."

President Harding Guest of Michigan Chapter

President L. A. Harding and Director of Research F. C. Houghten were the principal speakers at the November meeting of the Michigan Chapter, held at the Cadillac Athletic Club, Detroit, November 10. Sixty-five members and guests were in attendance. Before the

speakers were introduced, President E. E. Dubry presented Secretary A. V. Hutchinson, who told of his recent trip to the chapters on the west coast.

President Harding's subject was "Utilization of the Sun's Energy," which was illustrated with lantern slides. He described the earliest types of machines used for harnessing the sun's energy, including that used in the experiments now being made by the French scientist Claude, utilizing the difference in water temperatures at the surface of the ocean water and at about 200 ft. below the surface.

President Harding mentioned a practical utilization of the sun's energy in the use of so-called hot boxes on the roofs of buildings in such places as Florida and California where the domestic hot water is heated entirely by the sun's rays and maintained at a temperature as high as 110° F. the year round. Under certain conditions in the summer time, he stated, it is not impossible to find that the sun's energy is equivalent to 5000 hp. per acre. President Harding predicted that in the future, weather forecasts may be made by taking readings of the solar energy.

Director F. C. Houghten spoke on "Solar Energy and Its Effect on Heating and Ventilating Problems." His discussion touched upon the absorption properties of the sun's energy by different thicknesses of roof slabs and the release of this absorbed heat during different periods of the day and night.

Zone Control Suggested for Combination Iron and Light-Weight Radiation Systems

President Dubry called upon the secretary to present the questions which had been submitted for discussion in answer to the question, "What is the best method of control in a residence where the downstairs is equipped with extended surface copper fin radiation and a portion of the upstairs is furnished with cast iron radiation?" The prime factor to be considered, it was brought out, is that copper fin radiation gives off its heat very rapidly but does not hold its heat after the steam pressure is reduced, whereas, to the contrary, cast iron radiation gives off its heat less rapidly and tends to hold its heat even after the steam pressure is reduced. In the general discussion of this question, members W. J. Whalen, E. D. Purdy, G. R. Atherton, W. T. Harms, C. S. Leuchtenberg, J. D. Cantwell and Ray S. M. Wilde gave their interpretations of the most efficient as well as economical method of control. While no definite solution was reached in general it was the consensus of opinion that in all probability the best method of control would be zone control, but it was also brought out that without zone control it would be possible to secure good results by properly manipulating the dampers on the concealed radiators.

After this discussion, J. F. McIntire presented a question to the chapter as follows: "What effect is to be had on the heat emission of cast iron radiation and of concealed radiation if the relative humidity of the air in the room is increased from 20% to 50%?" In the general discussion which followed, the consensus of opinion seemed to be that no appreciable difference was to be had in the heat emission from a cast iron radiator under this condition, whereas it was entirely possible that the heat emission from a concealed or extended surface type of radiator might be increased, due to the difference in weight of the air at a relative humidity of 50%, as compared with a relative humidity of 20%.

It was brought out by William A. Rowe that in the future it is entirely probable that in the heating of residences a definite attempt would be made to heat the floor to a comfortable temperature and at the same time have a temperature in the breathing zone of the room ranging from 60° to 68° with a resultant overall temperature which would be more comfortable than if it is attempted to keep the temperature of the air of the breathing zone at 70°, as is common practice today.

New York Chapter Visits Lighting Institute

Members and guests of the New York Chapter visited the Westinghouse Lighting Institute at the regular monthly meeting, December 15. Ralph Newmuller, director, described the purpose of the institute and explained the changes which have taken place in lighting. L. J. Murphy, of the Westinghouse organization, discussed motors, with special reference to quiet motors. Following these talks, two reels of moving pictures were shown and the members visited the various rooms of the institute.

At the business meeting preceding the lighting program, the sections of the New York Building Code relating to heating and ventilating were read by Louis T. M. Ralston, whose committee studied the code. The code seemed to be inadequate from the remarks made from the floor, and apparently did not express the needs or ideas of the members of what the code should cover. Discussion was led by Messrs. West, Goodwin, Carrier, Nichols and McKiever. The report of the Committee on the Building Code was accepted as read, with regret that more time was not available for study and discussion.

Plumbing and Heating Industries Publicity Program

A budget of $101,000 for the work of the Plumbing and Heating Industries Bureau during 1931 was set by the directors of the bureau at a meeting at the Palmer House, Chicago, November 8. This figure was based on the report of Secretary-Manager E. L. Flentje. At the same time, Mr. Flentje presented his resignation to become commissioner of the National Plumbing and Heating Institute. In his report on Regional Management Conferences, Mr. Flentje stated that twelve dramatic sales and management presentations have been made in as many cities since August 1. The average attendance at these conferences was 233.

Plumbing and Heating Industries Bureau Publishes New Secretary's Manual

Detailed methods for specific local association programs are emphasized in the new Plumbing and Heating Association's "Secretary's Manual" published by the Plumbing and Heating Industries Bureau, December 1st. The new manual has been placed in the hands of more than 425 executives of state, zone, and local contractor groups of the industries. It is bound in limp leather, of pocket size, and is loose leaf, to permit supplements and revision.

Preparation of the manual as published has covered a period of three years, according to the announcement of the bureau. The description of methods is along lines worked out in discussions of organization at three annual Presidents' and Secretaries' Conferences of the industries. Technique for market surveys and other phases of association activity is based on three classifications of cities, while material for cooperative advertising and for sales classes is bureau-tested material.

Pending the action of 1931 national conventions on committees and by-laws, the first section of the manual has been withheld from publication. It will be added to the manual shortly after the national convention.

The manual contains sections outlining the form of state and regional organizations, and a section devoted to the qualifications and selection of association officers.

All Plumbing and Heating Industries Bureau materials and services are listed in an appendix at the close of the manual. Bookkeeping materials are listed with order number and price, as are modernizing electros of seal, window stickers and decalcomania.

Correspondence

Heating Economies in Montgomery Ward Buildings

EDITOR HEATING AND VENTILATING:

I have read the article "Heating Economies in Montgomery Ward Buildings" which appeared on page 96 of HEATING AND VENTILATING for November.

The following refers to the two questions raised in the introduction of this article.

1. There is no reason why a vacuum return line system cannot be operated so that vacuum is carried back through the steam mains to the pressure reducing valve, provided the pressure reducing valve is of the lever and weight type or of such a type that it will reduce from pressure to vacuum. Most spring-loaded reducing valves can be converted to the lever and weight type so they will operate under vacuum. The proper method of operation is to run the vacuum pumps continuously so they will provide in the returns the maximum vacuum of which they are capable. The weights on the pressure reducing valve are then adjusted to give the pressure or vacuum in the steam mains required by the prevailing weather conditions.

Many vacuum pumps are capable of producing a vacuum of 16 in. of mercury in the return piping. If a difference in pressure of 2 in. of mercury between supply and return is sufficient to provide proper circulation, as is the case in many buildings in which the returns are free from pockets or lifts, then it is possible to carry a vacuum up to 14 in. of mercury in the steam mains. If the size of the radiators in the building is such that at 0° outdoors, a steam pressure of 1 lb. per sq. in. in the radiators will keep the building at the proper temperature, then steam in the radiators under a vacuum of 14 in. of mercury will provide the proper amount of heat when the outdoor temperature is approximately 20°.

This means that for all outdoor temperatures up to 20° it is possible properly to control indoor temperature without intermittent operation, provided the vacuum pumps are capable of pulling a 16-in. vacuum. If the vacuum pumps can pull more than 16 in., then control is extended to outdoor temperatures above 20°. With such operation, it is essential that all radiator and drip traps be in proper working condition, free from dirt and seating properly.

Another method of maintaining an indoor temperature of 70° with a vacuum return line system, without intermittent operation, is to throttle the steam entering the individual radiators and thus obtain fractional heating. One way of accomplishing this is to use hand-operated modulating radiator valves. This method is not practical, however, because building occupants will seldom bother to adjust these valves. A better way of throttling the steam is to use a fixed orifice in the inlet to each radiator and to vary the flow through the orifices by varying the steam pressure. Still another way is to use self-contained thermostatic radiator valves of which there are several makes now on the market. These valves automatically throttle the steam according to the room temperature. Unless the steam flow into radiators can be regulated by some method of throttling, it is impossible to control temperature with vacuum return line systems except by intermittent operation.

2. In making comparisons on the degree day basis, the degree days for both tests should be calculated for the same indoor temperature. If during one test it is impossible properly to control the heat output of the system so that an excessive amount of fuel or steam is used and excessive indoor temperatures exist, no correction should be made for this. Lack of control, high indoor temperatures, and high fuel consumption are inseparable; to correct for indoor temperature would be to correct for one of the results of lack of control. The only condition under which it is permissible to correct for indoor temperature is that in which the indoor temperature is purposely maintained at different levels in different tests.

Attention is called to an apparent error in calculating the coal used per 100 sq. ft. radiation per degree day for the test with vacuum return line operation as given at the bottom of the second column in the table. 70,918 ÷ (98.161 x 63.92) = 11.3 instead of 10.95.

It has been customary in the past to calculate degree days on a 65° basis, yet in many cases as in these tests, the 24-hour average indoor temperature is more nearly 70°. The average temperature with differential operation, when temperature was supposedly being controlled as desired, was 70.2°. From this it appears that an average temperature of 70° fits the requirements for this building. That being the case, degree days should have been calculated on a 70° basis instead of on a 65° basis. There is really no logical reason for using the 65° base under such conditions.

Using 70° as a basis for calculating degree days, the results are as follows:

	On Differential Vacuum Heating System Operation	On Vacuum Return Line Operation
Total degree days (70° basis).....	78.26	73.92
Coal used per 1000 sq. ft. radiation per degree day, lb.....	6.46	9.78
Per cent savings resulting from differential operation:	$\frac{9.78 - 6.46}{9.78} = 33.95\%$	

This compares with 34.34% saving calculated by using the 65° base for degree days. It is true that the difference in the results obtained by the two methods is small in this case. This difference increases, however, with outside temperature, and for tests run in very mild weather, the error caused by using the 65° base for calculating degree days might be considerable. Where accurate results are desired in tests such as this one, the indoor temperature used as a base for calculating degree days should be the 24-hour average temperature existing in the building when the desired indoor temperatures are being maintained. With the prevailing tendency to maintain 72° to 73° during periods of occupancy, it is believed that in buildings such as office buildings and stores, it will be found that the average temperature for the entire day will be more nearly 70° than 65°.

STERLING S. SANFORD

Detroit, Mich.

A Westerner's Comment on the *School Building Reference Number*

EDITOR HEATING AND VENTILATING:

After reading your SCHOOL BUILDING REFERENCE NUMBER (September, 1930) from cover to cover, I was amazed at the wide diversity in heating and ventilating practice over the forty-one States heard from. To think that the old-time

masonry ventilating shafts with banks of wall or school pin radiators installed therein to act as aspirators, are still in vogue and going strong for classroom ventilation, is rather startling.

In the first place, the motive power available for setting up air movement is very slight and varies with the outside weather temperature. The only time that full air movement is available is on a zero day with no appreciable wind pressure, such a day as is picked for testing out the job to show how effective it is.

The writer made numerous tests on such old time systems in another state twelve years ago, both anemometer and powder fuse smoke tests, and found all possible variations and vagaries in air deliveries up to complete reversals. Then there is the ponderous size of the shafts built into the corridor walls and the cost of the additional building width required, to say nothing of the heat units turned loose to all out doors by the aspirating coils.

Next, I was surprised that toilet ventilation by means of chimney action is still in vogue, with aspirating heating coils or a steel stack inside of a brick chimney with the space between for ventilating the toilet—only useful when the heating plant is in operation,—much higher first cost than a small local fan exhausting from the utility chamber—to say nothing of the vagaries due to change in weather conditions such as heavy wind pressure, reversing the action of the aspirating flue.

Chimney action for moving air, either for classroom or toilet ventilation, a heritage from the open grate fire, is a wonderful talking point for the lay member of the school board, but very ineffective year in and year out over changing weather conditions. If you don't believe it, take an anemometer and a roll of miner's fuse and test a job for a couple of weeks with the weather ranging from zero to 50° F. above and the wind from a still, quiet day to 20 or 30 miles an hour, and be sure to test both sides of the building when the wind is blowing.

Next, I was impressed with the still unsettled condition of the age-old controversy between blast systems and the so-called split systems of heating and ventilating; that is, the concentration of all the heating means in blast coils or a warm-air furnace at one point and the distribution of warmed air 50° to 60° above room temperature by duct systems to each room, or the division of the eggs into two baskets, direct radiators in each room and ventilating air heated by blast coils to 70°.

Here again I say that it is a question of motive power, with the balance in favor of the split system. With a well-designed piping system, seldom is any radiator short-changed on steam, but how about the room at the end of a long run of a blast duct system when outside wind pressure gets in its deadly work?

Just last year I tested out an old-time blast system with the anemometer and thermometer. The delivery temperatures varied 20°, and air quantities 100%. Did the automatic temperature control system take care of the situation? No, it had long since gone 'haywire' (in the vernacular). It was an old-time single-line air system where a delicate adjustment is required at the restriction valve.

There was no possibility of getting an appropriation to have it overhauled and adjusted, so my advice was to install additional volume dampers in the duct system and adjust them by cut-and-try against anemometer readings to give a more equitable distribution of air quantities to the various rooms and then to install hand-adjusting devices on the hot and cold-chamber mixing dampers, and adjust them by hand against thermometer readings to compensate for the longer air travel to the rooms at the far ends of the duct systems.

Six years ago I was employed to prepare plans to revamp the heating system of a three thousand-pupil high school in this county (Los Angeles). The old system was described to a T in one of the articles in the school practice symposium — fan-blast job, hot and cold chambers at fan room, under-corridor trunk air ducts, vertical delivery shafts to classrooms on inside corridor walls, chain-operated dampers in said shafts. Well, the pressure from the school officials finally condemned it and direct radiators were installed in all the rooms and the fan-blast system limited to the auditorium only. Gravity exhaust ducts of the auditorium vent system were replaced by an exhaust fan installation, and the temperature control system was thoroughly overhauled.

Two years ago complaints developed of cold-air drafts from supply grilles due to misoperation of temperature-control apparatus—mixing dampers did not stay in intermediate positions but went clear over from hot to cold-air chamber delivery. This time I prescribed regrouping of the Vento banks so that cold-chamber delivery temperature would only be slightly under room temperature.

Twelve years ago, while located in Utah, I designed heating and ventilating systems for two fourteen-classroom grade schools, which were of identical floor plan, one a split system and the other a blast system. Sales propaganda was to the effect that the blast installation would be considerably lower in first cost and subsequent operation cost. There was very little difference in first cost, and the operation of the split job was more economical, satisfactory and dependable.

I am a firm believer in simplicity, and while I was amazed by the complication still attained in some of the school installations referred to, I still believe the trend is towards simplicity. With high-pressure boilers stoker-operated, and with electric generators still going strong for high school plants, some of the utility companies must be charging good old-time rates. The rates on the Pacific coast would never warrant a generating plant in a high school. The average high school would have a hard time attaining a 15% load factor. My experience has been that it takes nearer 50% load factor to come anywhere near paying interest on capital charges for the excess cost of the plant over a simple low-pressure installation. But then, we are all entitled to our differences of opinion.

One writer ties into cast-iron sectional boilers—says they are more prone to prime than steel boilers. It is easy to pass the buck to the boiler for many sins that the poor old boiler has nothing to do with. I have seen steel boilers prime just as successfully as cast-iron. My early training was with the good old locomotive where priming on certain divisions of the railroad was a major problem requiring special water treatment and, surely, the locomotive boiler is one of the finest designs of steel boilers. Then, ye gods! I learn that one-pipe steam heating is obsolete and should be obsolete. We still put them in in Los Angeles and, just the other day, the mechanical engineer in charge of operation of the heating plants of over 400 schools confided to me that he was getting stronger for gravity every day.

Vapor systems require either alternating receivers, direct-return traps or other devices to allow the use of thermostatic traps on the return ends of radiators. Two-pipe gravity systems, with swing check valves on the return end of radiators, are not passé out here. A well-designed two-pipe gravity system, with plenty of clearance above the water-line to take care of pressure drop, and good air valves on all the radiators, and at proper locations at points of drop of steam and return mains, makes a very simple installation.

Out here we put Mercoid switch low-water cut-outs on our oil-fired boilers to protect against vacuum-pump failures. I cannot see the advantage of transferring the float mechanism of the low-water cut-out to an automatic feeder connected up to take its water from an overhead tank into which the vacuum pump discharges and particularly so as the overhead tank has another float-operated valve mechanism on its city water connection to get out of order.

On gas-fired jobs, we put the low-water protective devices, which are now standard for the special gas boiler, on gas-

fired boilers of the ordinary sectional type. On my last vacuum pump installation I put, in addition, a motor-operated gas cut-out valve in the gas line ahead of the boiler burners which can be set to cut off the gas if the vacuum-pump motor circuit is interrupted and shuts down the pump.

Although all of my work in this locality is either with gas or oil, I have had considerable contact with coal in Utah. My opinion is that stokers have no place in any but the largest school plants. Operating efficiencies under test conditions and year-in year-out operation are two very different propositions. I sat in on operation for several years with the chief engineer of a small central heating and power-generating plant (25,000 sq. ft. of radiation in six buildings, 50,000 kw-hr. per month generation). We had stokers to begin with. By keeping the chief on his toes to cut out waste and everlastingly at it with the Orsat apparatus and differential draft-gauge readings to increase boiler efficiency, we cut 1000 tons of coal off the previous year's record, a 20% improvement.

I make the same contention out here where we burn oil or gas, that it is not so much the kind of burner or apparatus, but rather the skill in operation that saves fuel. A capable fireman with an interest in his work will make an excellent showing in saving coal whether he has a good hand-fired grate boiler setting or stokers. What I say is, why load up the capital cost on small plants?

Twelve years ago I converted a small high school plant in a rural district of Utah from high-pressure to low-pressure and from stoker-fired to hand-fired. To me, brick-set return tubular boilers with stokers seem more appropriate for a large-sized industrial plant than a school building.

But now I find I am getting far afield from the main issue, a simplified code for boards of education, written by the engineers of the country broad enough to allow blast or split systems, window ventilation where it is feasible, unit ventilators with or without direct radiators, with all the earmarks of super-equipment salesmen and obsolete specifications eliminated. Just a few brief paragraphs covering space requirements per pupil, temperature range for different rooms, cubic feet of air per minute for classrooms and auditoriums, air changes per hour for exhaust systems for toilet rooms, kitchens, cafeterias, locker and shower rooms, etc. I would suggest that HEATING AND VENTILATING act as a clearing house for such a code.

It would seem to me that the code suggested by Mr. Nelson would make an excellent starting point. My major criticism of this code is that it eliminates so-called window ventilation, which practically all southern states with mild climates seem to report as satisfactory.

I hold no brief for window ventilation and have vigorously opposed it in cold climates, but you cannot deny the ever-present idea inherent in every teacher that if the window is open there must be ventilation. So far, the unit ventilator actually running in a classroom has far more psychological effect on that teacher than all the conversation in the world about the big fan in the basement delivering so many cubic feet of air per minute through the grille in the inside wall.

Once I had to contend with a grey-haired principal in a school where we had just installed a split system with supply ducts to every classroom. When we were testing out the job she came to me and said, "You can't tell me that you can get enough fresh air from your fan and duct system. I know that when the windows are open the children will get fresh air." Well, I convinced the good lady, but I pulled a fast one on her to get away with the argument. I demonstrated the air-movement capabilities of the fan by letting the good lady stand in front of the fan inlet while the operator threw in the switch. In those days the skirts were long. So was the yell that the surprised principal let out as they went skyward.

O. W. OTT.

Los Angeles, Calif.

Automatic Controls

EDITOR HEATING AND VENTILATING:

I would be glad if you can bring before the various manufacturers of electrically-operated automatic controls, more especially those designed to be used in connection with manufactured gas, the following resume of the special regulations now in force throughout New Zealand governing the installation and use of such appliances.

"All motor-operated (or otherwise electrically-operated) devices, used to open or close any gas valve on any gas main, must have the body of such device insulated from the main body of the valve or gas main by not less than 2 in. of approved insulating material (wood impregnated with creosote or paraffin is permissible) and the stem or plunger connected with the moving part of the valve must also be insulating material interposed between the metal parts. Unless all such instruments, whether of the solenoid or motor-operated type, are so constructed that no possibility of current leakage to the gas main is possible, as above, their use will be prohibited. Any external terminals provided for the connection of wiring from the regular electric supply must be enclosed in a metal junction box, with provision for the joining up of conduit or flexible metal tube, to complete the installation.

"As the current in this country is all 230 volts 50 cycle A.C. single phase, or 400-volt 50 cycle 3-phase, it is necessary that all due precautions be taken against short-circuits or accidental shocks, hence the stringent conditions obtaining, and these follow very closely the restrictions applying in Great Britain."

Automatic controls are receiving quite a deal of notice here, but unless makers observe the above-mentioned regulations, they cannot hope to expect any support for their products.

H. B. ALLEWAY

Christchurch, New Zealand.

Maintaining 70 Degrees with a Vacuum Return Line System

EDITOR HEATING AND VENTILATING:

The editor's note under the heading "Heating Economics in Montgomery Ward Buildings," in the November issue of HEATING AND VENTILATING raises two questions, but I believe you have overlooked the real question.

The answer to your first question is yes. A properly designed, installed and equipped vacuum return line system properly operated will maintain an inside temperature of approximately 70° F. without intermittent operation.

The answer to the second question is also affirmative, providing all of the other factors affecting the heat loss from the building remain constant. If the steam per pound of fuel is constant in both tests, the only saving that is possible is made in the elimination of overheating.

The real question or puzzle arising from the report is, "What became of the missing B.t.u.'s?"

According to the report we must assume that the efficiency of the boiler plant remained constant; that the fuel was exactly the same in both tests; and that the steam delivered to the header was exactly the same in quality and quantity per pound of fuel burned. If this is true, how could all this excess steam be condensed without a much greater overheating of the building? What were the other atmospheric conditions outdoors besides temperature? Was it calm during one test and a heavy gale blowing during the other? Was it bright sunshine during one test and dark and cloudy during the other? Were all the windows kept closed during both tests? Just what were the factors increasing the heat loss from the building? I am very curious to know, "What became of the missing B.t.u.'s?"

H. G. THOMAS

Chicago, Ill.

Wages and Conditions in Steam Fitting Trade Vary Widely

A survey of wages and conditions in the steam fitting trade in 215 cities, made by the Heating and Piping Contractors National Association, as of November 1, 1930, indicates that differences between various communities are quite marked, even in adjacent territories.

In 137 of the 215 cities agreements exist with unions. Steamfitters' wages range from a low of 60 cents in Hagerstown, Md., and St. Johnsbury, Vt., to a high of $1.75 in Collinsville and Granite City, Ill., Jersey City and East St. Louis.

Helpers' wages range from a low of 27½ cents in Jackson, Tenn., to a high of $1.23¾ in Mt. Kisco and New Rochelle, N. Y. Wages for laborers range from a low of 25 cents in Columbia and Bennettsville, So. Car., El Paso and Roanoke, to a high of $1.25 in Elizabeth, N. J.

Of the 215 cities, 155 reported the supply of men to be plentiful; 40 as equal, 1 as fair and 2 as scarce. The two last were Derby, Conn., and Reno, Nev.

Sixteen cities reported the men as being 100% employed. These were: Bangor, Me.; Beverly, Mass.; Billings, Mont.; Bismarck, N. D.; Cincinnati, O.; Derby, Conn.; Dubuque, Ia.; Eau Claire, Wis.; Kankakee, Ill.; Lake Forest, Ill.; Middletown, N. Y.; New Britain, Conn.; Olean, N. Y.; Reno, Nev.; Rome, N. Y. and Sheboygan, Wis.

Unemployment in the trade reaches a peak in San Diego, Cal., where only 20% of the men are at work.

Nineteen of the 215 cities report having an apprentice system.

Welding to be Taught at Albany

A course for the instruction of mechanics to prepare them to become welders for the building trade will become part of the industrial high school curriculum at Albany, N. Y.

This action was taken because out-of-town welders had to be imported for local jobs as no local mechanics were available. The situation was explained to the Albany Board of Education, and the appeal for instructions in oxy-acetylene welding was acted upon by the board December 2.

Manufacturers Display Keen Interest in Oil Burner Show

Unprecedented interest in the eighth annual oil burner show, to be held at Philadelphia next April, is being displayed by manufacturers of oil burning equipment and accessories, according to the American Oil Burner Association. Shortly after December 1 only 19 booths out of 123 remained unsold and many of the remaining booths had been placed on option. The 104 spaces already sold have been taken by 63 exhibitors.

Harry F. Tapp, executive secretary of the association which is staging the show in connection with the annual convention at the same time, said plans were under consideration for adding more booths to the total space available to accommodate those who may be unable to secure space otherwise.

Committee of Ten Expands Activities

At the December meeting of the Committee of Ten of the Coal and Heating Industries, in Columbus, December 2, in conjunction with the semi-annual meeting of the National Warm Air Heating Association, it was decided that the many demands for assistance from the committee would necessitate expanding activities. Steps are to be taken to provide additional means of contact between the committee and local organizations.

The morning meeting of the committee was a session confined to committee members only, to make additional arrangements for carrying on the widespread interest which has manifested itself in the committee movement.

The welcome of additional organizations to the Committee of Ten movement was thoroughly discussed, and two additional national groups are to be invited to participate in the movement at this time.

Modernization Cost 17% Less than Year Ago

Cost of interior remodelling and modernizing work and general improvements both inside and outside of the house shows decided price declines from last year, according to the latest findings in the general survey of commodity prices now being made by the Marine Midland group of eighteen New York State banks. Results of the survey are the basis of an advertising campaign which the banks are conducting in an effort to stimulate trade.

Taking seven typical improvements as standard for comparison, costs in every instance show savings over last year's prices ranging from 10% to 32%. These figures represent an accurate check of today's values with those of 1929, with all the estimates based on actual figures obtained from plumbing, painting, electrical contractors, carpenters, etc. The estimates in each case include labor.

The cost of a steam heating system, including new boiler, radiators and fittings, today is $375 as compared with $450 for the same installation a year ago, a saving of 17% for the home owner.

First International Traffic Tunnel Opened

(Continued from page 91)

have been constructed, one at each end. Each building is approximately 100 ft. high, on a site 50 ft. x 90 ft. Each structure with its equipment, provides ventilation for half of the subway. Equipment consists of 24 fans motor driven through chain drives. The fans are arranged in successive tiers in different stories, with direct connections to the subway ducts. Each fan is 12 ft. in diameter and there are 12 of them in each building—six blower fans to draw in fresh air and six exhaust fans to expel used air and automobile gases.

The total amount of fresh air that can be supplied to the ducts of the tunnel is approximately 1,500,000 cu. ft. per min., which gives a complete change of air throughout the tunnel every 90 sec. Fresh air comes into the tunnel under the roadway, escaping through curved apertures near the curb line. Used or vitiated air is drawn off through two rows of openings located at frequent intervals in the ceiling of the tunnel.

Fresh air is drawn into the ventilating tower through gill-like apertures on three sides of each ventilation building. These gills consist of glass louvers, each louver being 2 ft. long by 8 in. wide. There are 3,000 of them in each building. Glass is used because it is easily replaced and it admits light as well as air into the interior of the building. Vitiated air is expelled through exhausts located at the top of each building.

Three separate methods of construction were employed in building the tunnel. Probably the most spectacular construction feat was the fabrication, launching, towing and sinking of the nine steel tubes comprising the underwater portion of the tunnel. These tubes have an aggregate length of more than half a mile, all of which is under water.

The tunnel will effect a saving of more than 100 miles over the short route south of Lake Erie for travel between Detroit and Buffalo.

Burnside R. Value was the executive engineer in charge of the project, working under the direct supervision of Mr. Klapp of Parsons-Klapp-Brinkerhoff & Douglas, consulting engineers.

Estimating Gas Consumption on the Degree Day Basis

For a steam heating system designed to maintain 70° F. inside temperature in zero weather, 0.096 cu. ft. of 1,000 B.t.u. per cu. ft. gas are required per square foot of radiation per degree day when the system operates at 100% efficiency.

It is necessary to correct this unit figure for designed temperatures other than 0—70°, for heating values other than 1,000 B.t.u., for efficiencies other than 100%, and for hot water systems, provided the latter type of system is installed.

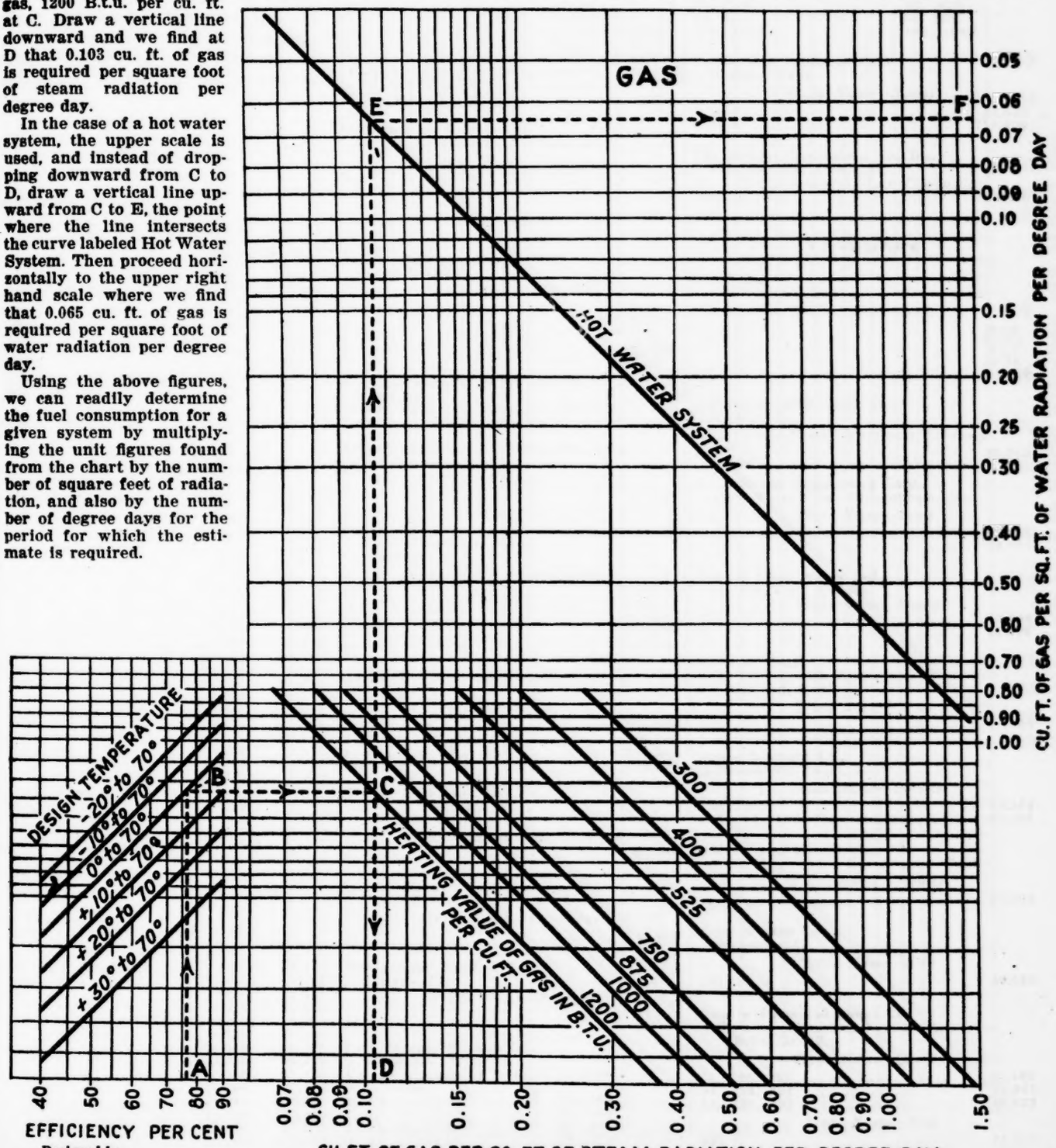
Based on the above, the corrections can be made by using the accompanying graph, which will give the number of cu. ft. of gas required per square foot of either steam or water radiation per degree day.

Assume that a gas-fired heating system is operating at a seasonal efficiency of 76%, in a city where the heating plant was designed to maintain 70° in 0° weather, and that the system is burning a natural gas with a heating value of 1200 B.t.u. per cu. ft. What is the gas consumption per square foot of steam radiation per degree day? Per square foot of water radiation per degree day?

This problem is solved by the use of the Gas Chart. Locate the efficiency, 76%, on the efficiency scale at A. Through the point where this line intersects with the design temperature, 0°, at B, draw a horizontal line to the heating value of the gas, 1200 B.t.u. per cu. ft. at C. Draw a vertical line downward and we find at D that 0.103 cu. ft. of gas is required per square foot of steam radiation per degree day.

In the case of a hot water system, the upper scale is used, and instead of dropping downward from C to D, draw a vertical line upward from C to E, the point where the line intersects the curve labeled Hot Water System. Then proceed horizontally to the upper right hand scale where we find that 0.065 cu. ft. of gas is required per square foot of water radiation per degree day.

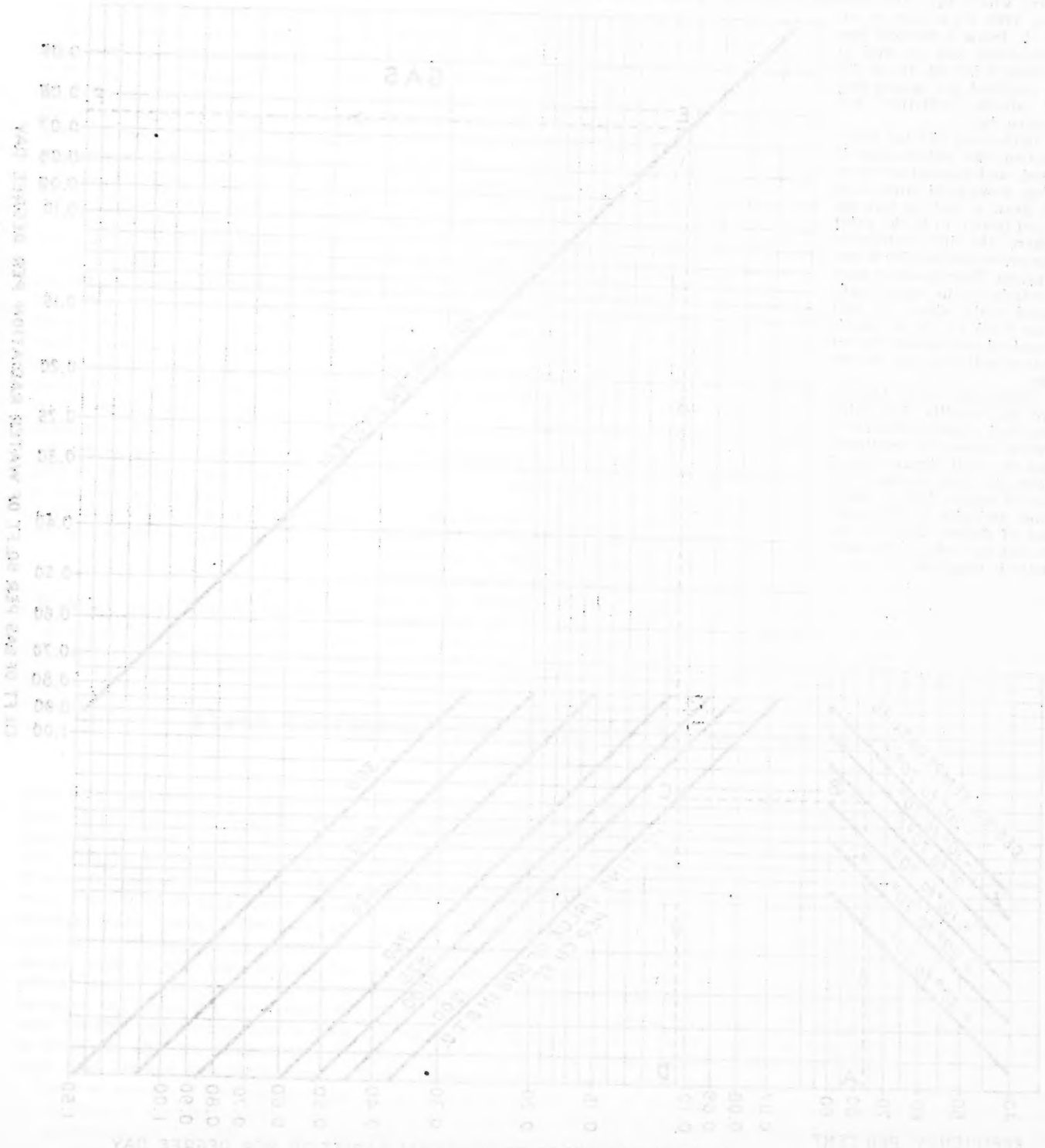
Using the above figures, we can readily determine the fuel consumption for a given system by multiplying the unit figures found from the chart by the number of square feet of radiation, and also by the number of degree days for the period for which the estimate is required.



Designed by Clifford Strock

Heating and Ventilating Data Sheet No. 5-U

Degree Day Charts—Estimating Gas Consumption



Additional Boilers, Furnaces and Radiators Approved by American Gas Association

THE following house-heating appliances have passed the requirements of the American Gas Association's testing laboratory and are published in addition to the list which appeared in the March, August and October issues of HEATING AND VENTILATING. The list includes those appliances approved from October 1 to December 1. It does not include radiant heaters.

Boilers

American Radiator Co.,
40 West 40th St., New York.

Trade Name—Ideal Arcola

	Output Rating Sq. Ft. Steam Radiation	Sq. Ft. Water Radiation
1-GA-4		210
1-GA-5		280
1-GA-6		350
1-GA-7		420
2-GA-4		420
2-GA-5		560
2-GA-6		700
2-GA-7		840

Peerless Heater Co.,
Boyertown, Pa.

Trade Name—Peerless

101 S5, W5, ST5, WT5, Change hot water radiation to 5,550 sq. ft.		
23 S5, W5, ST5, WT5.....	7,990	12,770
24 " " " "	8,340	13,320
25 " " " "	8,680	13,900
26 " " " "	9,020	14,480
27 " " " "	9,370	15,020
28 " " " "	9,720	15,560
29 " " " "	10,060	16,110
30 " " " "	10,400	16,660
31 " " " "	10,750	17,220
32 " " " "	11,100	17,780
33 " " " "	11,440	18,320
34 " " " "	11,780	18,860
35 " " " "	12,130	19,430
36 " " " "	12,480	20,000
37 " " " "	12,830	20,550
38 " " " "	13,180	21,110
39 " " " "	13,530	21,650
40 " " " "	13,880	22,200
41 " " " "	14,220	22,740
42 " " " "	14,560	23,280
43 " " " "	14,910	23,850
44 " " " "	15,260	24,420
Change ratings of following boilers:		
16 S3, W3, ST3, WT3.....	1,870	2,990
13 S5, W5, ST5, WT5.....		7,220

Simplex Valve and Meter Co.,
Philadelphia, Pa.
Change steam rating to 920 on Simplex Boiler.

The Thatcher Co.,
39 St. Francis St., Newark, N. J.

Trade Name—Thatcher

23 S5, W5, ST5, WT5.....	7,990	12,770
24 " " " "	8,340	13,320
25 " " " "	8,680	13,900
26 " " " "	9,020	14,480
27 " " " "	9,370	15,020
28 " " " "	9,720	15,560
29 " " " "	10,060	16,110
30 " " " "	10,400	16,660
31 " " " "	10,750	17,220
32 " " " "	11,100	17,780
33 " " " "	11,440	18,320
34 " " " "	11,780	18,860
35 " " " "	12,130	19,430
36 " " " "	12,480	20,000
37 " " " "	12,830	20,550
38 " " " "	13,180	21,110
39 " " " "	13,530	21,650
40 " " " "	13,880	22,200
41 " " " "	14,220	22,740
42 " " " "	14,560	23,280
43 " " " "	14,910	23,850
44 " " " "	15,260	24,420
Change ratings of following boilers:		
16 S3, W3, ST3, WT3.....	1,870	2,990
13 S5, W5, ST5, WT5.....		7,220

Western Pipe & Steel Co.,
608 So. Dearborn St., Chicago, Ill.

Trade Name—Wepsco

1	540

Furnaces

Aladdin Heating Corp.,
Oakland, Calif.

Trade Name—Aladdin

	Input Rating B.t.u. per hr.
7	100,000

American Foundry & Furnace Co.,
Bloomington, Ill.
Change trade name American (No. 14) to American (Bloomington)

Atlas Heating and Ventilating Co., Inc.,
San Francisco, Calif.

Trade Name—Atlas

12-36	85,000

Carrier-Lyle Corp.,
850 Frelinghuysen Ave.,
Newark, N. J.

Trade Name—Weathermaker

301	120,000
305	120,000
302	171,000
303	228,000
304	285,000

Dayton Power & Light Co.,
Dayton, O.

Trade Name—Daytona

917	214,000
1015	256,000
1115	342,000
1215	428,000

Detroit Michigan Stove Co.,
6900 E. Jefferson Ave.,
Detroit, Mich.

Trade Name—Detroit-Michigan

6096	90,000

Lennox Furnace Co.,
Marshalltown, Ia.

Trade Name—Torridzone

250	40,000

Montgomery Ward & Co.,
Chicago, Ill.

Trade Name—Windsor

1110	62,500

L. J. Mueller Furnace Co.,
Milwaukee, Wis.
Change numbers of furnaces to those following:

1, 1A, 10, 10AS	1S, 1SF
2, 2A, 20, 20AS	2S, 2SF
3, 3A, 30, 30AS	3S, 3SF
4, 4A, 40, 40AS	4S, 4SF
5, 5A, 50, 50AS	5S, 5SF
6, 6A, 60, 60AS	6S, 6SF
7A, 70A	7S, 7SF
8A, 80A	8S, 8SF
9A, 90A	9S, 9SF
10A, 100A	10S, 10SF

Pacific Gas Appliance Co.,
Oakland, Calif.

Trade Name—Harris

	Input Rating B.t.u. per hr.
3, 300	88,000
4, 400	130,000

The Surface Combustion Co., Inc.,
237 Dorr St., Toledo, O.

Trade Name—Surface Combustion

W-1	125,000

Circulators

Cahill Co.,
Chattanooga, Tenn.

Trade Name—Cahill

	Input Rating B.t.u. per hr.
12	24,000

Comstock Castle Stove Co.,
Quincy, Ill.

Trade Name—Mayflower Economy

100	35,000

F. J. Evans Engineering Corp.,
1305 Watts Bldg., Birmingham, Ala.

Trade Name—Dixie

1	13,750
2	24,750

General Steel Wares Ltd.,
London, Ont., Canada.

Trade Name—Sunny

15	15,000
25	25,000

Hammer Bray,
E. 12th & 26th Aves.,
Oakland, Calif.

Trade Name—Spark

602	20,000

Moore Brothers Co.,
Benton St., Joliet, Ill.

Trade Name—Puritan

18A2714N	70,000
18A1714, 18A1715, 18A1740.....	35,000

O'Keefe and Merritt Co.,
3700 Mines Ave., Los Angeles, Calif.

Trade Name—Pioneer

12c	24,000

J. W. Patten Co.,
Sycamore, Ill.

Trade Name—Hero

100	40,000

Quality Stove and Range Co.,
Division of Oakland Foundry Co.,
Belleville, Ill.

Trade Name—Quality

95, 295, 395	25,000
94, 294, 394	30,000
93, 293, 393	40,000

Trade Name—Boss

935	25,000
934	30,000
933	40,000

	Input Rating B.t.u. per hr.
Reznor Mfg. Co., Mercer, Pa.	
Trade Name—Reznor	
501	8,000
550	16,000
Rock Island Stove Co., Rock Island, Ill.	
Trade Name—Royal	
66 B	46,000
F. O. Schoedinger, Columbus, Ohio.	
Trade Name—Thermola	
ECT5	30,000
Trade Name—Thermoray	
GT4, GTF4	24,000
GT6, GTF6	36,000
CCT3	18,000
ACT 6	42,000
A. F. Thompson Mfg. Co., Huntington, West Va.	
Trade Name—Thompson	
18	30,000
55,718	15,000
56,1928	18,000
724	20,000

Steam Radiators

American Gas Products Corp., New York, N. Y.

Trade Name—A.G.P. Corto

6	Col.	4	Sec.	32"	Unvented	13,500
6	"	6	"	"	"	20,200
6	"	10	"	"	"	33,600
6	"	5	"	38"	Vented	12,000
6	"	7	"	"	"	16,800
6	"	12	"	"	Unvented	40,300
6	"	15	"	"	"	50,300

Automatic Gas-Steam Radiator Co., 301 Brushton Ave., E. Pittsburgh, Pa.
Change 5 Col. 12 Sec. 38" Vented to 24,000 rating

Pacific Gas Radiator Co., Huntington Park, Calif.

Trade Name—Pacific

5	Col.	7	Sec.	38"	Vented	14,000
5	"	9	"	"	"	18,000
5	"	11	"	"	"	21,500
5	"	13	"	"	"	25,000
5	"	15	"	"	"	29,000
5	"	20	"	"	"	39,000
5	"	25	"	"	"	46,000
5	"	5	"	26"	"	8,000
5	"	7	"	"	"	10,500
5	"	9	"	"	"	13,000
5	"	11	"	"	"	13,550
5	"	13	"	"	"	18,000
5	"	15	"	"	"	20,000
5	"	20	"	"	"	28,000
5	"	25	"	"	"	35,000

Canadians Plan 400-Mile Natural Gas Line

Construction of one of the largest natural gas projects ever undertaken in Canada has been started by the Tri-Cities Utilities, Ltd., and associated interests. Plans have been completed for laying a line from the Kinsella field in Alberta, to Regina, Sask., a distance of 357 miles. An extension of 32 miles to connect with another system at Moosejaw, is contemplated, making a total distance of 389 miles not including branch and feeder lines which are expected to increase the total to more than 400 miles. The project will cost $20,000,000.

Anthracite Club Expects 1000 at Annual Meeting

The principal speakers at the annual meeting of the Anthracite Club, to be held at the Hotel Astor, New York, January 22, will be John Lewis, president of the United Mine Workers of America, and Senator James J. Davis of Pennsylvania. The attendance is expected to reach 1000, and delegations will be present from New England, Buffalo, and the principal cities in the anthracite regions. Noah Swayne will be the toast master at the annual dinner.

L. B. Gallison, vice president in charge of sales of the Philadelphia and Reading Coal and Iron Company, spoke at the December meeting of the Anthracite Club of New York, held at the Hotel McAlpin, December 17. The subject of Mr. Gallison's talk was "Merchandising." He urged the coal dealers to learn more of their customers' problems and keep complete records on their heating systems, the amount of coal that they use, and suggested that the dealers keep in touch with them from time to time to determine whether or not they are satisfied with the service they are getting. Mr. Gallison pressed the point that all of the coal dealers' customers are on the prospect lists of the gas companies and oil burner dealers.

Boston Selected for N.D.H.A. Convention

Boston, Mass., will be the place, and June 2-5 the time for holding the next annual convention of the National District Heating Association. Headquarters will be at the Hotel Statler. This was one of the decisions reached at the Executive Committee meeting of the N.D.H.A., held in Rochester, N. Y., October 30-31.

Progress on the forthcoming N.D.H.A. Handbook was reported by Chairman J. H. Walker of the Educational Committee. Ten chapters, he stated, are now completed and four more are in hand, leaving one more chapter to come. The book will be approximately 400 pages, and it is expected that it will be in the hands of the printers by May, 1931, and ready for distribution by January 1, 1932. The page size will be 6 in. x 9 in. Final action on the matter of price of the book was deferred to the annual meeting.

New members of the association elected by the committee are: City Steam Heating Co., Olympia, Wash.; Carl E. Heeren, New York; Harold Hilton, New York; Louis J. Hoeflinger, New York; Maurice Milch, Budapest, Hungary; C. H. B. Hotchkiss, New York, N. Y., and William O'Brien, Syracuse, N. Y.

Heating Board of Trade of New York

Berman on Board of Governors

Louis K. Berman, president of the Raisler Heating Company, has been elected a member of the Board of Governors in place of R. B. Miller, resigned.

Mr. Berman has been active with his company for 25 years and during this period has exercised an important part in bringing his firm to its present position of prominence in the heating industry.

Rules of Practice

The committee, composed of Kennedy Duff, C. E. Daniel, E. F. Keating, William LeCompte and T. P. McLaughlin, appointed some time ago to recommend rules of practice to the Board of Governors, which might be helpful in establishing the relationship of the groups of the industry, has been analysing the problem and will report at an early date. Those measures which are contemplated relate to establishing a voluntary procedure designed to make competition fairer, patterned somewhat after the resolutions approved by the Federal Trade Commission in the case of many National Trade Associations.

Over 240 Manufacturers to Exhibit at Chicago's Power Show

Over 240 manufacturers of power equipment and appliances will exhibit at the exposition to be held in Chicago, February 10-14, while the meetings of the Midwest Power Engineering Conference and the Fuels Division of the A.S.M.E. are being held at the Stevens Hotel.

Among the papers to be presented at the Fourth National Fuels Meeting will be the following: "Developments in the Small Stoker Field," by T. A. Marsh, Chicago; "Conversion of Small Coal-Fired Furnaces to Gas Firing," by W. D. Edwards, consulting engineer, Memphis, Tenn.; "Dust Recovery and Air Pollution," by H. N. Dubar, Dust Recovery, Inc., New York.

At the Refrigeration and Ventilation Session, February 10, of the Midwest Power Engineering Conference, Willis H. Carrier will present a paper entitled "New Application of Refrigeration in Air Conditioning."

Domestic Oil Burners

Listed by Underwriters' Laboratories from

August 22 to September 23, 1930

MANUFACTURER	MOTOR DRIVE	SAFETY CONTROL	IGNITION	FUEL FEED	MARKING	FUEL
Ballard, Arthur H., Inc., Boston, Mass.	A.C.	Combustion (Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat).	Gas.	Suction from supply tank.	Underwriters' Lab. label on fan housing; also "No. 77" on Time-O-Stat Lockswitch with "No. 48-H" on combustion thermostat.	Not heavier than No. 5.
	A.C. or D.C.	Combustion (Mercoid "Type SA" combustion thermostat, or "Type S" Adjustatherm with "Type L" combustion thermostat or "Type SDE" Adjustatherm with "Type M-1" combustion thermostat (Models 5, 7, 9, and 11); or Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat or Penn Heat "Type F-5" relay with "Type A-1" combustion thermostat (Models 4 and 6).	Gas or electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type C" on nozzle unit housing, also "Type SA" or "Type L" or "Type M-1" on Mercoid combustion thermostat, or "No. 48-H", Time-O-Stat, or "Type A-1" on Penn Heat combustion thermostat.	Not heavier than No. 3.
Boughton Heating Co., Worcester, Mass.	A.C. or D.C.	Combustion (own manufacture combustion thermostat.	Gas (expanding pilot) or electric (hot-wire) or manual.	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on burner housing; also letter "S" on leg support, floor fitting, and strainer; also "Type OB" on flexible hose coupling, also "Type Jr. 10" or "Type T" on relay switch for automatic electric ignition burner.	Not heavier than No. 3.
Century Engineering Corp., Cedar Rapids, Ia.	A.C.	Combustion (Mercoid "Type SM" combustion thermostat or Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat).	Gas or electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "No. 77" on Time-O-Stat Lockswitch with "No. 48-H" on combustion thermostat or "Type SM" on Mercoid combustion thermostat.	Not heavier than No. 3.
Diamond Burner Co., Wilmington, Del.	A.C.	Combustion (Minneapolis-Honeywell "Type R-107-1" Protectorelay with "Type A" or "Type B" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on burner base, also "Type C" on Minneapolis-Honeywell "Type B" combustion thermostat.	Not heavier than No. 3.
Fuelo Engineering Corp., New York, N. Y.	A.C.	Combustion (Minneapolis-Honeywell "Type BPR-1" or "Type A" Protectorelay with "Type B" combustion thermostat).	Gas (expanding pilot).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on base plate; also "Type B" on Minneapolis-Honeywell combustion thermostat.	Not heavier than No. 3.
Malleable Iron Fittings Co., Branford, Conn.	A.C.	Combustion (Minneapolis-Honeywell "Type R-101" Protectorelay with "Type B-6" combustion thermostat or Minneapolis-Honeywell "Type U-10-C" Protectorelay with "Type A-4 or B-3" combustion thermostat, or Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat, or Penn Heat Control "Type D-1" relay with "Type F-1" or "Type F-2", or "Type F-5" relay with "Type A-1" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type B-6" or "B-3" or "A-4" on Minneapolis-Honeywell combustion thermostat, or "No. 48-H" on Time-O-Stat combustion thermostat, or "Type B-1" or "Type A-1" on Penn Heat control combustion thermostat.	Not heavier than No. 3.
Silent Automatic Corp., Detroit, Mich.	A.C. or D.C.	Combustion (Minneapolis-Honeywell "Type PRO-1" or "Type R-101-1" Protectorelay with "Type B" combustion thermostat, or Penn Heat "Type D-2" control with "Type A-2" combustion thermostat, or "Type F-2" control with "Type A-1" combustion thermostat)	Gas or electric (hot-wire).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on control unit case; also Model A on burner base, or Model B-L on burner motor, or Model E on burner motor; also "S-2" on constant level chamber; also "Type B" on Minneapolis-Honeywell combustion thermostat, or "D-2" or "F-2" on Penn Heat combustion thermostat.	Not heavier than No. 1 (Model E burner), not heavier than No. 2 (Model A burner and Model B-1 burner with electric ignition), not heavier than No. 3 (Model B-L burner with gas ignition).
Silent Glow Oil Burner Corp., Hartford, Conn.	A.C.	Combustion (Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat, or Mercoid "Type SM" combustion thermostat).	Gas.	Gravity from supply tank or listed automatic pump (Model S-1), or suction from supply tank which must in all cases be located below the level of pump (Model S-2).	Underwriters' Lab. label on carburetor unit (Model S-1) or on motor pump unit (Model S-2); also letter "S" on burner base and castings; also "No. 77" on Time-O-Stat combustion thermostat or "Type SM" on Mercoid combustion thermostat.	Not heavier than No. 2.
Torridheet Division, Cleveland Steel Products Corp., Cleveland, O.	A.C.	Combustion (Minneapolis-Honeywell "Type A" or "Type BPR" Protectorelay with "Type A" combustion thermostat, or Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat)	Gas (expanding pilot).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on control unit relay cover; also "Model U" on burner motor, constant level chamber and gas pilot; also "Type A" on Minneapolis-Honeywell combustion thermostat, or "No. 48-H" on Time-O-Stat combustion thermostat.	Not heavier than No. 2.
Wayne Home Equipment Co., Fort Wayne, Ind.	A.C. or D.C.	Combustion (Minneapolis-Honeywell "Type A or BPR or PRO-2 or R-103-1" Protectorelay with "Type A or B" combustion thermostat, or Minneapolis Honeywell "Type DSS or DSSV" motor switch with "Type B" combustion thermostat, or Time-O-Stat "No. 77" Lockswitch with "No. 48-C" or "No. 48-H combustion thermostat, or Mercoid "Type SA" combustion thermostat).	Gas (expanding pilot) or electric or gas-electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type A or B" on Minneapolis-Honeywell; or "No. 48-C or "No. 48-H" on Time-O-Stat or "Type SA" on Mercoid combustion thermostat.	Not heavier than No. 3.

Degree Days and Unit Fuel Consumption in Typical Cities for November

UNIT fuel consumption figures given below must be corrected for efficiency, heat content of fuel other than that listed below, for radiation emitting other than 240 B.t.u. per hr., and for radiation calculated on a basis of other than zero to 70°.

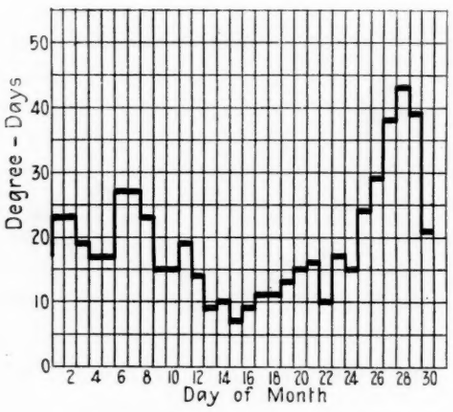
Coal is assumed as having a heat content of 12,000 B.t.u. per lb., gas, 1000 B.t.u. per cu. ft. and oil 140,000 B.t.u. per gal. To correct for other heating values, multiply the fuel consumption listed under the charts by the standard heat content just listed, and divide by the heat content in question.

To correct for efficiency, divide the fuel consumption by the efficiency of the heating installation.

For water radiation, multiply the fuel consumption, which is given for steam radiation, by 5/8.

For radiation installed for any other outside temperatures than zero, multiply the fuel consumption given under the charts by 70°, divided by the quantity (70 minus the outside temperature used).

	Los Angeles	Baltimore	Philadelphia	New Orleans	Atlanta	Cleveland	Cincinnati	Detroit
Degree Days	89	525	522	157	468	608	609	730
Lbs. of Coal per Sq. Ft. of Radiation for November, 1930	0.712	4.200	4.177	1.257	3.744	4.864	4.872	5.840
Gals. of Oil per Sq. Ft. of Radiation for November, 1930	0.061	0.360	0.358	0.108	0.321	0.417	0.418	0.501
Cu. Ft. of Gas per Sq. Ft. of Radiation for November, 1930	8.54	50.4 (See Footnote)	50.11	15.07	44.93	58.37	58.46	70.8



New York, November, 1930

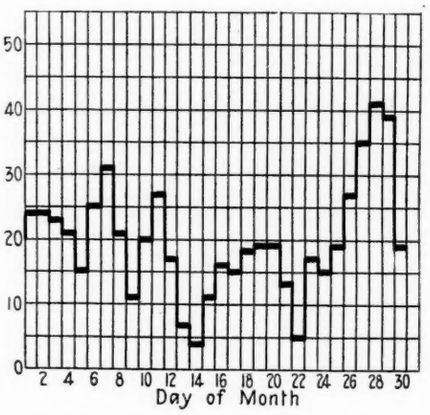
Degree Days 576—to Date, 905

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.608

Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.395

Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 55.30

(See Footnote)



Boston, November, 1930

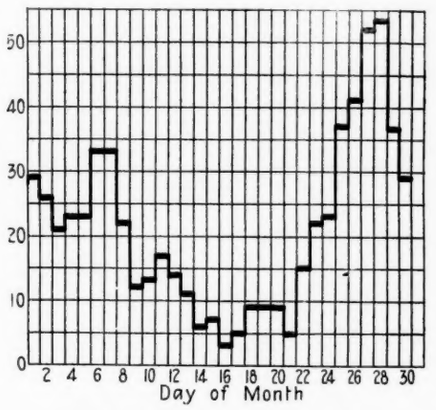
Degree Days 583—to Date, 990

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.664

Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.400

Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 55.97

(See Footnote)



Pittsburgh, November, 1930

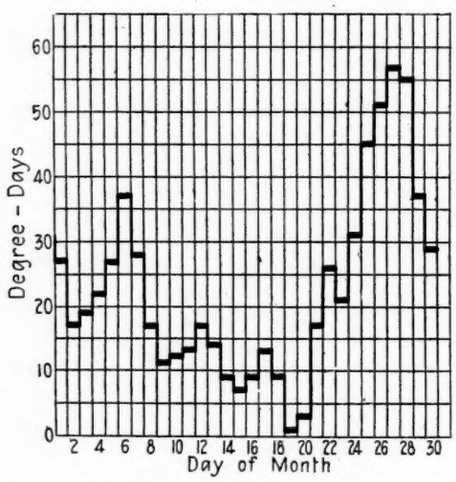
Degree Days 643—to Date, 1091

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 5.144

Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.441

Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 61.73

(See Footnote)



Chicago, November, 1930

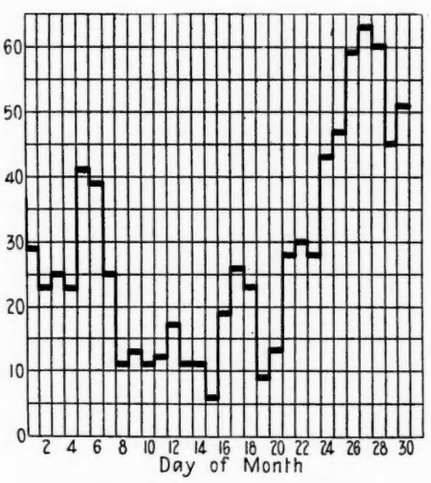
Degree Days 682—to Date, 1184

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 5.456

Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.468

Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 65.47

(See Footnote)



Minneapolis, November, 1930

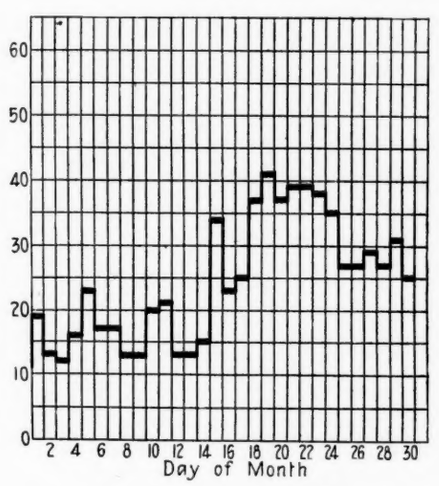
Degree Days 841—to Date, 1542

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 6.728

Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.577

Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 80.74

(See Footnote)



Denver, November, 1930

Degree Days 739—to Date, 1284

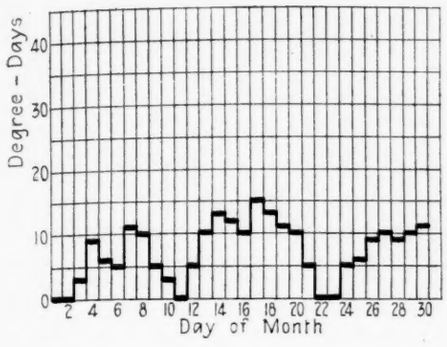
Lbs. of Coal per Sq. Ft. of Radiation for this Month, 5.912

Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.507

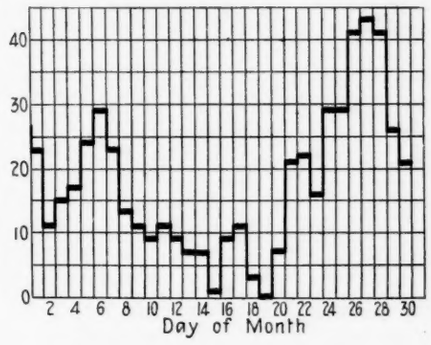
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 70.94

(See Footnote)

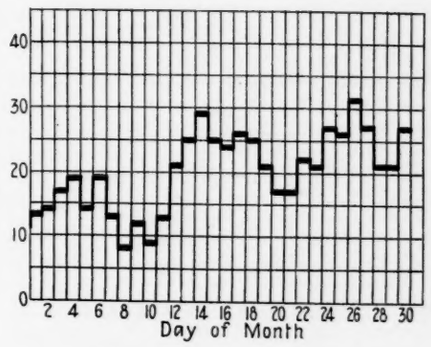
These figures must be corrected for local conditions as explained above.



San Francisco, November, 1930
Degree Days 219—to Date, 395
Lbs. of Coal per Sq. Ft. of Radiation for this Month, 1.752
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.150
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 21.02
(See Footnote page 104)



St. Louis, November, 1930
Degree Days 529—to Date, 834
Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.232
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.363
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 50.78
(See Footnote page 104)



Seattle, November, 1930
Degree Days 604—to Date, 1211
Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.832
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.414
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 57.98
(See Footnote page 104)

Better Furnace Fan Data Urged at Winter Meeting of National Warm Air Heating Association

AT the winter meeting of the National Warm Air Heating Association, held in Columbus, December 2-3, G. A. Voorhees stated that heating engineers are demanding more accurate data for fan capacities of fans used in connection with forced warm-air systems. He referred to the free air delivery mentioned in various fan data which do not apply when the system is installed.

Professor A. P. Kratz, of the University of Illinois, reported on the research residence work being carried on at the University for the Association. He stated that future investigations will cover such work as tests in conversion burners, the effects of bonnet fans, various points covering the mixture of outside air with recirculated air, operation of trunk line systems, the effect of flat ducts run parallel to the floor, a study of high side-wall registers, and the effect of storm sash.

Tests will be made on the effects of fins on furnaces, the ratio of heating surface to grate area, diving type flue, air filters, and underfeed stokers.

Tests at the university show that when a propeller type fan is used with a furnace, the path taken by the air in the cold air boot and casing results in areas of turbulency and reverse air travel. Future tests will seek means to overcome this.

The association has begun work on the formulating of recommendations for fan systems to be included in the Standard Code. The committee will attempt to collect all available data on fan installations in order that the recommendations to be inserted in the Standard Code will be practical.

Dr. E. Vernon Hill, publisher and editor of *The Aerologist*, Chicago, spoke on air conditioning. Defining air conditioning, Dr. Hill said that even radiator heat is one phase of air conditioning, but that to be really complete, we must be able to control air conditions so that any desired temperature, humidity, cleanliness or cooling effect might be obtained.

In the matter of conditioning air three factors must be taken into account—heating, ventilating and air conditioning. Dr. Hill stated that the public wants air conditioning badly and that it only remains to be seen who will be able to supply it.

I. L. Jones, chairman of the Better Business Committee, presented a resolution recommending that the president appoint a committee to meet with a similar committee from the Furnace Institute to formulate a plan whereby the two organizations can join hands and work cooperatively for common causes.

How Temperature Affects Industrial Accidents

A temperature above or below a certain mark in factories and workshops has an influence on the frequency of industrial accidents, according to Dr. G. H. Miles, director of the National Institute of Industrial Psychology, in a recent lecture in London. In most industries, Dr. Miles stated, accidents were at their lowest when the temperatures of the workshop or factory were between 60° and 70°. In one factory of which he had knowledge, accidents were at a minimum when the temperature was 67°. They increased by 30% when the temperature rose to 77° and by 17% when it dropped to 56°. Moreover, the accident rate when artificial light was used was found to be almost invariably higher than when natural light was used. The problem of preventing industrial accidents is vitally urgent in Dr. Miles's opinion, and he is convinced that the time is ripe for a more concerted attack from the psychological point of view.

Flentje Succeeds Swanson as Commissioner of National Plumbing and Heating Institute

Election of E. L. Flentje as Commissioner of the National Plumbing and Heating Institute, trade practice group of the industry, was announced by Fred W. Swanson, retiring Commissioner, and by members of the Institute Board. Mr. Flentje, secretary-manager of the Plumbing and Heating Industries Bureau, submitted his resignation to the Bureau Board effective immediately upon appointment of a successor.

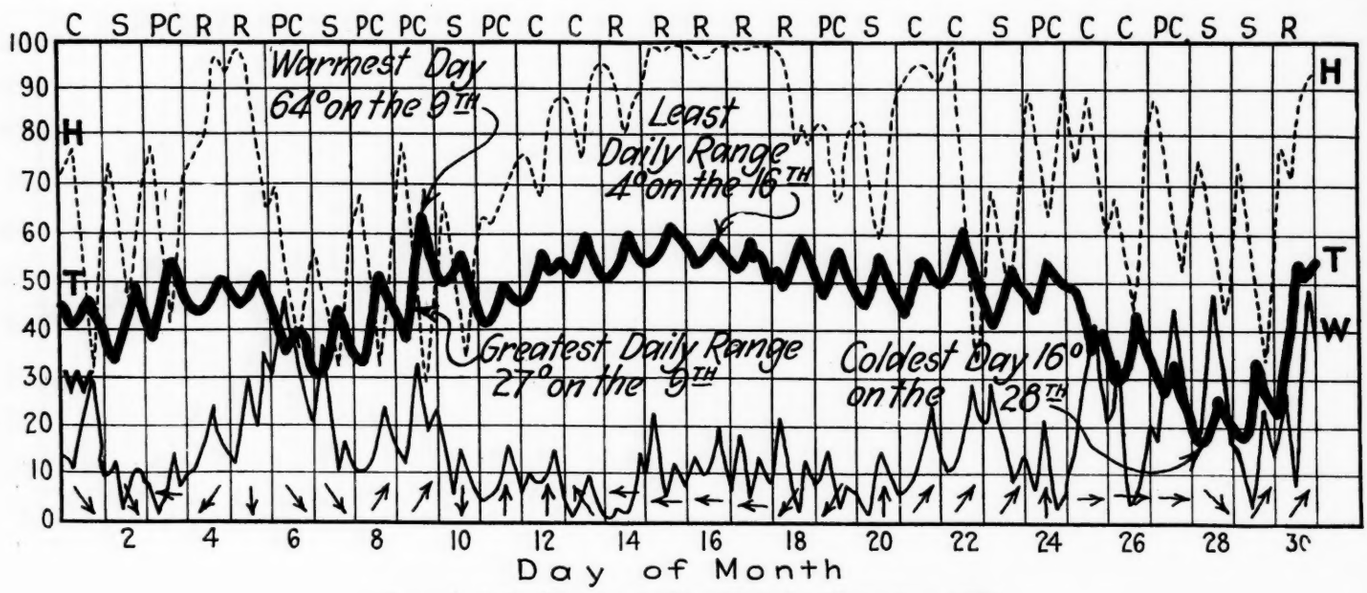
Mr. Flentje has been a member of the staff of the Plumbing and Heating Industries Bureau for the past four years. He served as head of the Bureau's advertising department, as director of the Philadelphia Plumbing and Heating Development League, as head of the commercial research and sales promotion department, and has been, for the past year, secretary-manager of the Bureau.

Erratum

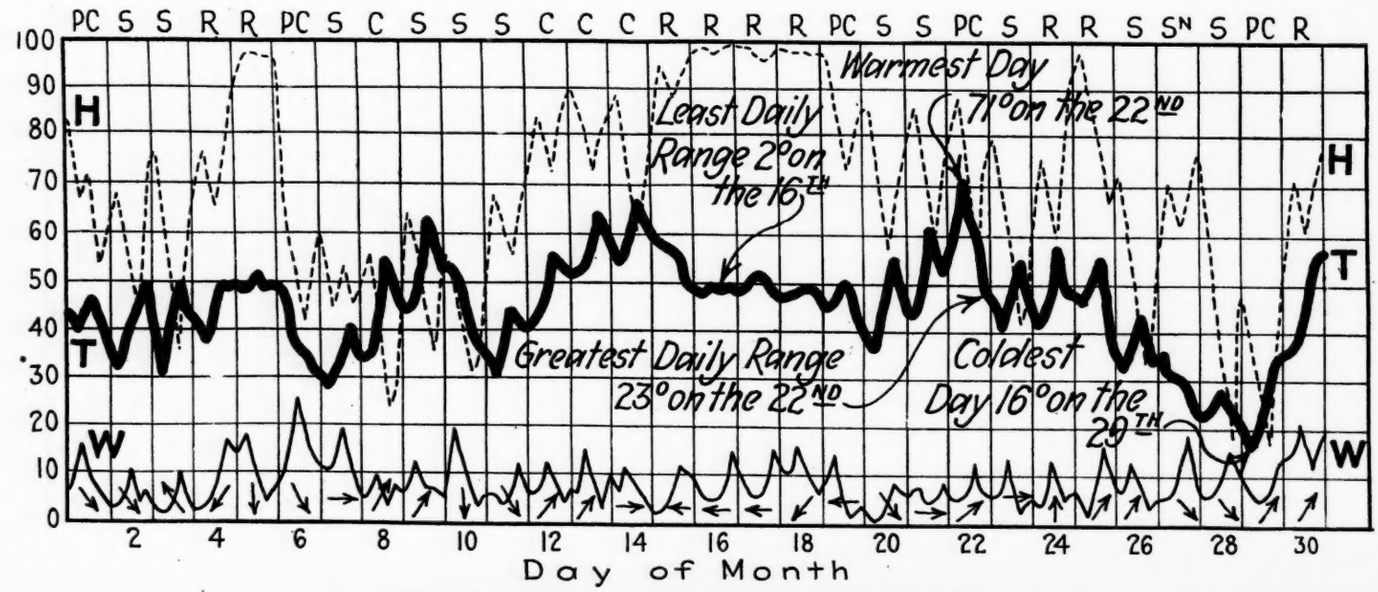
The author of "Duct Design for Fan-Steam Systems," which appeared on Page 82 of the December issue of HEATING AND VENTILATING, was Walter E. Heibel and not Walter F. Heibel.

The Weather for November, 1930

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F.	64	71	70	75	74
Date of highest temperature	9	22	21	19	19
Lowest temperature, deg. F.	16	16	7	1	15
Date of lowest temperature	28	29	27	28	28
Greatest daily range, deg. F.	27	23	31	25	29
Date of greatest daily range	9	22	29	8	8
Least daily range, deg. F.	4	2	6	6	9
Date of least daily range	16	16	13	30	11
Mean temperature for month, deg. F.	45.8	45	43.9	42.4	47.6
Normal mean temperature for month, deg. F.	44.2	42	43.2	40.1	45.4
Total precipitation, this month, inches	5.43	4.9	1.02	1.75	1.77
Total snowfall, this month, inches	Trace	0.1	2.6	1.7	0.2
Normal precipitation, this month, inches	2.96	3.33	2.29	2.37	2.83
Total wind movement, this month, miles	9775	5332	6209	7421	8948
Average hourly wind velocity, miles	13.6	7.4	8.6	10.3	12.4
Prevailing direction of wind	S.W.	S.W.	S.W.	S.W.	S.
Number of clear days	7	9	10	10	13
Number of partly cloudy days	8	10	5	10	11
Number of cloudy days	15	11	15	10	6
Number of days with precipitation	9	13	11	7	8
Number of days with snowfall	None	1	3	3	2
Snow on ground, at end of month	None	None	None	None	None


C S PC R R PC S PC PC S PC C C R R R R PC S C C S PC C C PC S S R
Warmest Day 64° on the 9TH
Least Daily Range 4° on the 16TH
Greatest Daily Range 27° on the 9TH
Coldest Day 16° on the 28TH
H
T
W
Day of Month

Record of the Weather in New York for November, 1930
(Hourly Observation of the Relative Humidity Plotted on this Chart)


PC S S R R PC S C S S S C C C R R R R PC S S PC S R R S SN S PC R
Warmest Day 71° on the 22ND
Least Daily Range 2° on the 16TH
Greatest Daily Range 23° on the 22ND
Coldest Day 16° on the 29TH
H
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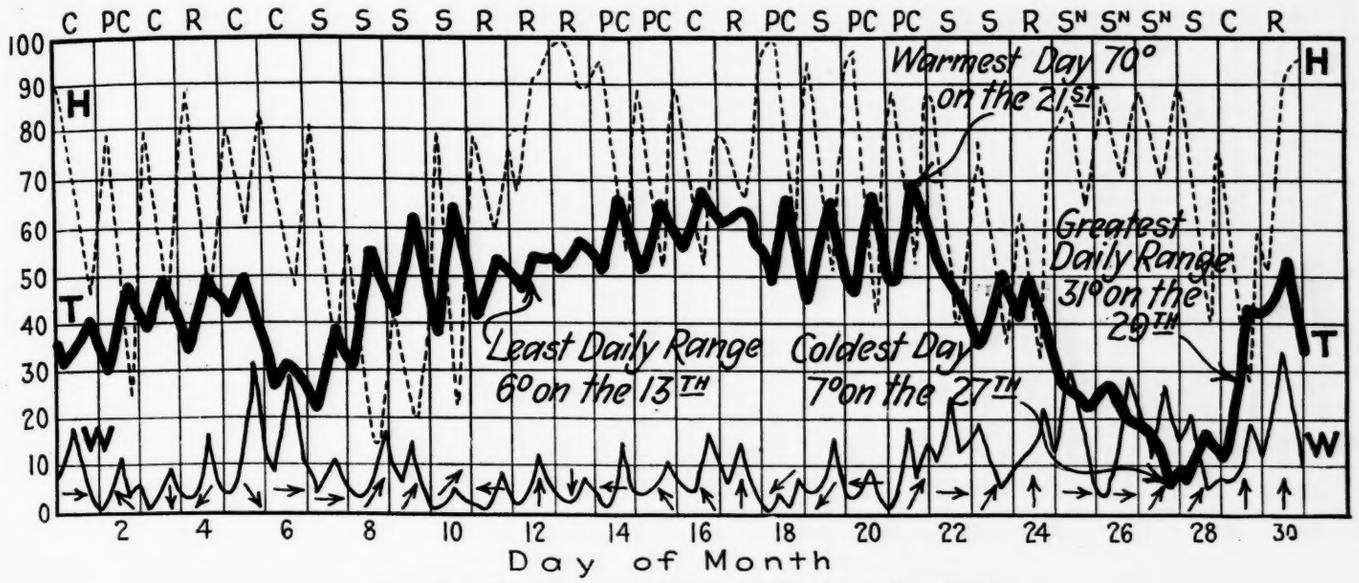
W
Day of Month

Record of the Weather in Boston for November, 1930


C PC C R C C S S S S R R R PC PC C R PC S PC PC S S R SN SN SN S C R
Warmest Day 70° on the 21ST
Greatest Daily Range 31° on the 29TH
Least Daily Range 6° on the 13TH
Coldest Day 7° on the 27TH
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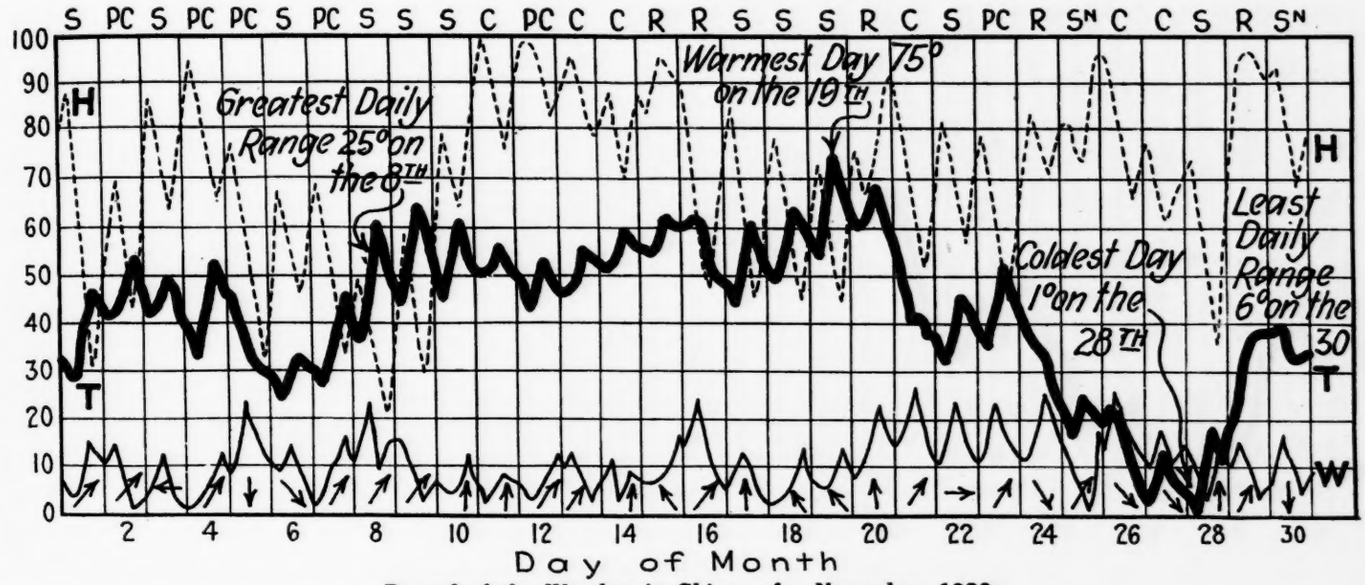
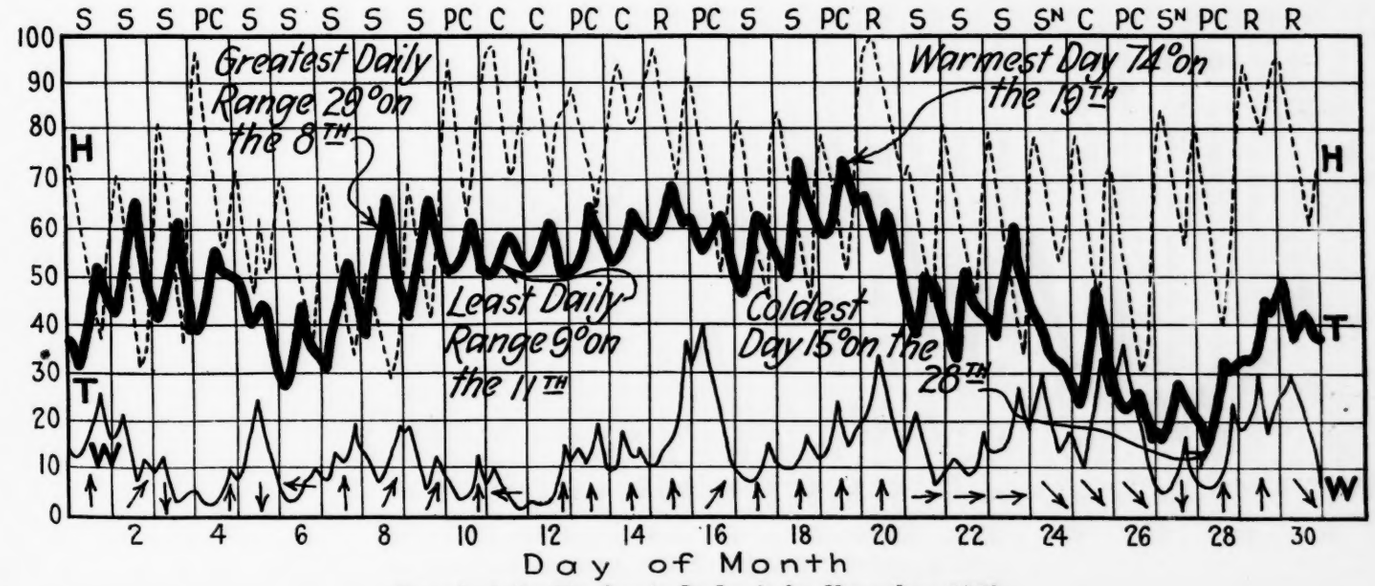
Day of Month

Record of the Weather in Pittsburgh for November, 1930


S PC S PC PC S PC S S S C PC C C R R S S S R C S PC R SN C C S R SN
Greatest Daily Range 25° on the 8TH
Warmest Day 75° on the 19TH
Coldest Day 1° on the 28TH
Least Daily Range 6° on the 30
H
T
W
Day of Month

Record of the Weather in Chicago for November, 1930


S S S PC S S S S S PC C C PC C R PC S S PC R S S S SN C PC SN PC R R
Greatest Daily Range 29° on the 8TH
Warmest Day 74° on the 19TH
Least Daily Range 9° on the 11TH
Coldest Day 15° on the 28TH
H
T
W
Day of Month

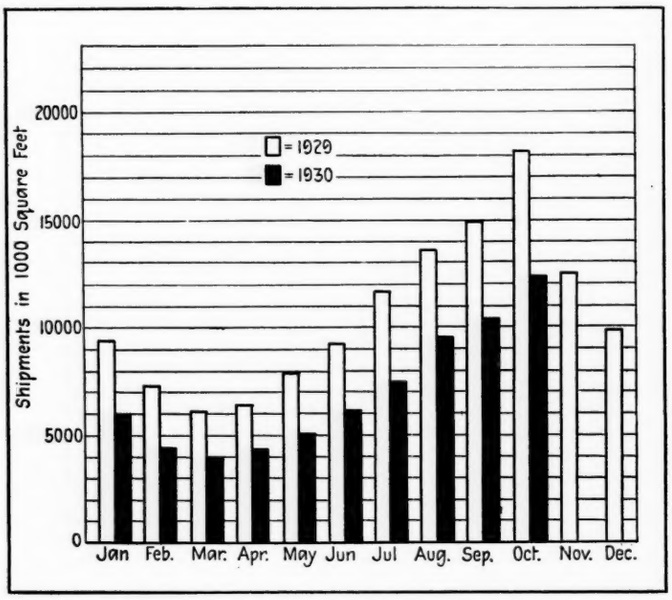
Record of the Weather in St. Louis for November, 1930

Plotted from records especially compiled for HEATING AND VENTILATING by the United States Weather Bureau.
Heavy lines indicate temperatures in degrees F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M. Arrows fly with prevailing directions of wind.
S—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.

HEATING AND VENTILATING

Statistical Service

Based on Data Supplied by the Department of Commerce

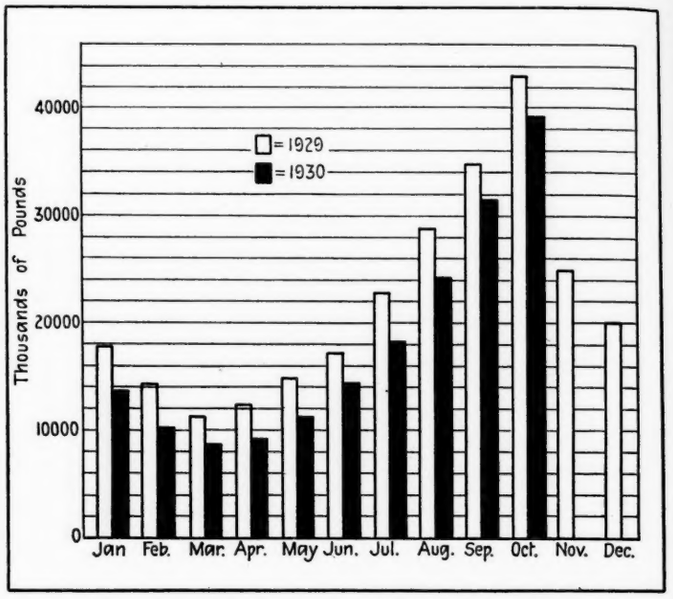


SHIPMENTS OF CAST-IRON RADIATORS

(In 1000 Square Feet)

As Reported by 15 Manufacturers Representing over 90% of the Industry

October, 1930, 12,390; October, 1929, 18,214; decrease over last year, 32%; total for ten months, 1930, 69,556; total for ten months, 1929, 104,996; decrease over last year, 33.8%.

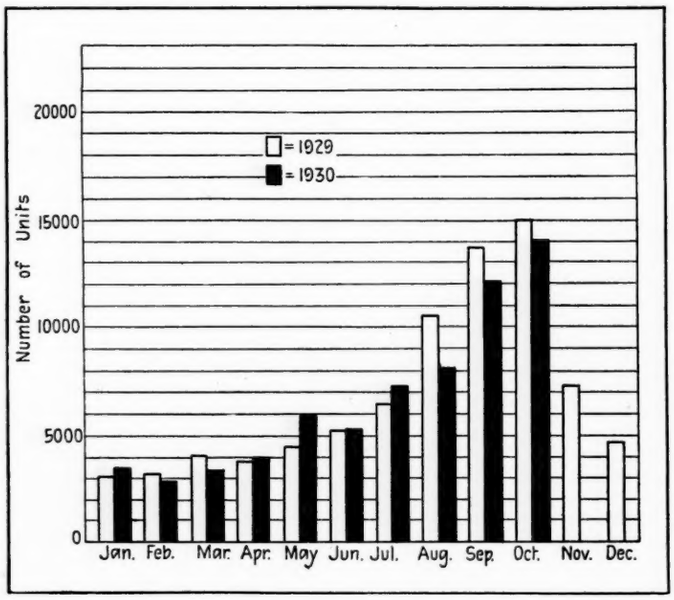


SHIPMENTS OF CAST-IRON SQUARE BOILERS

(In Thousands of Pounds)

As Reported by 25 Manufacturers Representing 90% of the Industry

October, 1930, 39,158; October, 1929, 43,185; decrease over last year, 9.32%; total for ten months, 1930, 181,147; total for ten months, 1929, 217,931; decrease over last year, 16.9%.

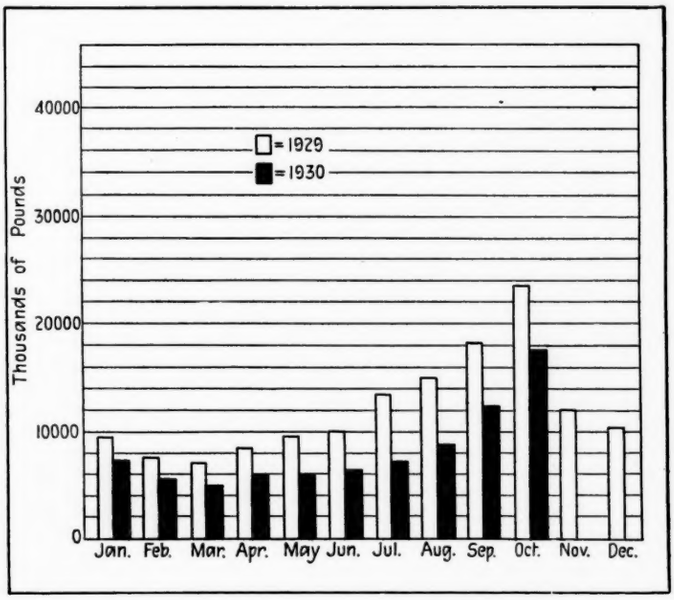


SHIPMENTS OF OIL BURNERS

(In Number of Units)

As Reported by 50 Manufacturers Representing 60% of the Industry

October, 1930, 14,064; October, 1929, 15,037; decrease over last year, 6.46%; total for ten months, 1930, 66,215; total for ten months, 1929, 69,753; decrease over last year, 5.07%.

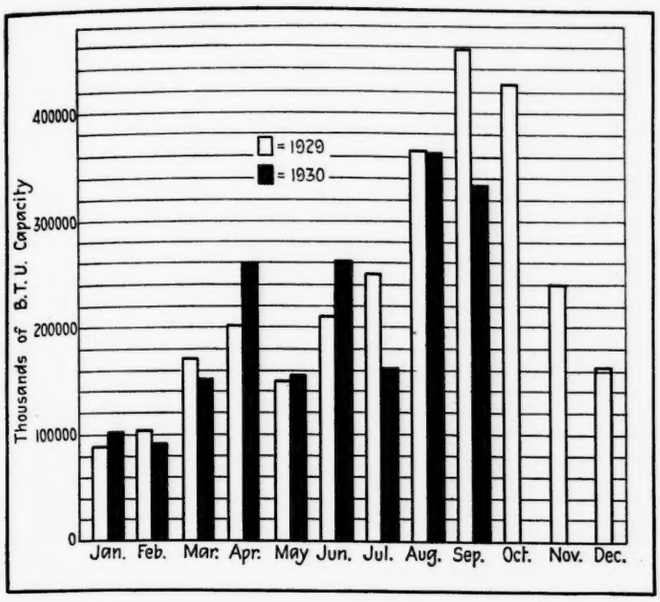


SHIPMENTS OF CAST-IRON ROUND BOILERS

(In Thousands of Pounds)

As Reported by 25 Manufacturers Representing 90% of the Industry

October, 1930, 17,774; October, 1929; 23,487; decrease over last year, 24.3%; total for ten months, 1930, 81,786; total for ten months, 1929, 123,340; decrease over last year, 33.7%.

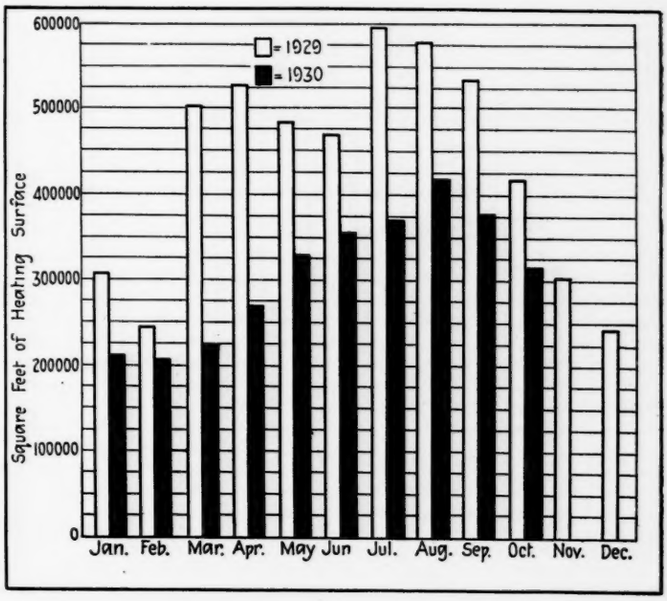


SHIPMENTS OF GAS-FIRED BOILERS

(In Thousands of B.t.u. Capacity)

As Reported by 8 Manufacturers Representing 75% of the Industry

September, 1930, 334,266; September, 1929, 459,124; decrease over last year, 27.2%; total for nine months, 1930, 1,877,375; total for nine months, 1929, 2,005,352; decrease over last year, 6.38%.



NEW ORDERS FOR STEEL HEATING BOILERS

(In Square Feet of Heating Surfaces)

As Reported by Firms Making Up the Greater Part of the Industry

October, 1930, 314,240; October, 1929, 421,725; decrease over last year, 25.43% total for ten months, 1930, 3,090,104; total for ten months, 1929, 4,680,913; decrease over last year, 34%.

Coal Research Laboratory Started at Carnegie Institute of Technology

A program of scientific research was begun at the newly organized Coal Research Laboratory of the Carnegie Institute of Technology, Pittsburgh, the middle of November. The laboratory is undertaking fundamental research in coal, and its work will be directed toward securing basic physical and chemical data which can be utilized by men who study coal and its derivatives from the point of view of the practical man. The laboratory also will undertake to train expert fuel technologists, and graduate courses will be offered with the research staff offering instruction.

Dr. H. H. Lowry, the director of the laboratory, was formerly with the Bell Telephone Laboratories, and is a graduate of Peking University and Ohio Wesleyan University, with a master's and a doctor's degree from Princeton University. Other members of the staff include: Dr. D. Roberts Harper, 3rd, formerly of the Union College staff; Dr. J. F. Weiler, formerly of the research department of the Eagle Picher Lead Company; William B. Warren, and Bernard Juettner.

The laboratory is located in Engineering Hall on the Carnegie campus. Announcement of the laboratory was made in May, 1930, by the president of the institute. The Buhl Foundation of Pittsburgh donated $50,000 at the outset and $25,000 per year for its maintenance for five years. Additional contributions totaling $50,000 per year for five years were made by United States Steel Corporation, General Electric Company, Koppers Company, New York Edison Company, Standard Oil Company of New Jersey, and Westinghouse Electric and Manufacturing Company.

Bituminous Coal Conference to be Held Next November

The Third International Conference on Bituminous Coal will be held at Carnegie Institute of Technology in November, 1931, according to a recent announcement by Dr. Thomas S. Baker, president of the institute. An invitation will be extended to scientists of all countries to take part in the meeting.

The results of recent studies of coal will be presented, and particular attention will be paid to the economics of the new methods that are being evolved.

"The Automatic Stoker for Heating Service, Using Illinois Coal"

A bulletin by Professors A. C. Willard and W. S. Severns of the University of Illinois, entitled "The Automatic Stoker for Heating Service, Using Illinois Coal," has been published in cooperation with the Illinois Coal Bureau. The bulletin contains a report of performance tests on an automatic stoker and steam heating boiler unit, among the conclusions from which are:

A less expensive grade of Illinois coal (costing $3.60 per ton in the bin) may be burned without visible smoke and with good efficiency, ranging from 65% to 70%. In the opinion of the authors, the principal saving from the use of automatic coal stokers will result from the use of a less expensive fuel, burned efficiently and smokelessly.

The stoker will perform automatically for considerable periods of time and maintain a practically constant steam pressure with a maximum variation of ¾ lb. above or below normal.

The attention required in heating service will depend on the weather conditions and the frequency with which the hopper must be refilled or the fire cleaned, at which time ash and clinker are also removed. In severe weather, the attention must be more frequent than in mild weather.

Erratum

Fig. 3, Page 105, in the December issue of HEATING AND VENTILATING, under the article "Oil" by Clifton L. Butler, was mislabeled as follows: "Oil Burner Installation in Plant of Biscuit Company. Two Burners Use No. 5 Oil, the Third, No. 3 Oil."

The caption should have read "Oil Burner Installation in Box and Carton Manufacturing Plant. The Three Burners are Fired with No. 5 Oil, Without Preheating."

The illustration is referred to in the text on Page 107, which states that the three burners used No. 5 oil. The error was not the author's.

New Apparatus and Appliances

The Heat Exchanger Refrigerating Unit for Space Cooling

Exhibited at the Power Show in New York for the first time, the Heat Exchanger refrigerating unit attracted considerable attention. The unit is manufactured by the Schwitzer-Cummins Co., Indianapolis, Ind.

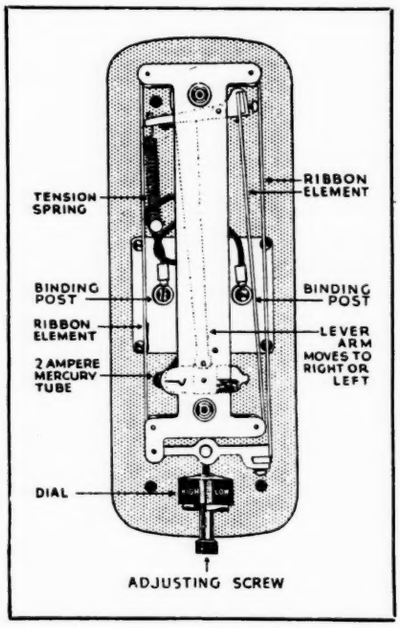
Operation of the system, shown in the accompanying drawing, is accomplished by setting the room thermostat to the desired point and closing the main line electric switch. The air blast from the fan swings out the defrosting vane, making contact in the mercury tube defrosting switch which energizes the valve circuit and opens the valve permitting the flow of refrigerant through the evaporator.

If sufficient frost accumulates on the evaporator surface to reduce the air flow and allow the defroster vane to drop through a small arc, the contact through the mercury tube is broken, the valve circuit is de-energized, and the supply of refrigerant is shut off until the continued air blast removes the accumulated frost.

When the unrestricted air flow through the evaporator again lifts the defroster vane the valve opens, continuing the refrigerating process.

This cycle repeats until the room temperature reaches the pre-determined point, at which time the flow of refrigerant is again halted by action of the room thermostat in the valve circuit.

The units are available for temperatures above 32°, and are in preparation for sub-freezing temperatures.



Humitrol

Lewis Humitrol

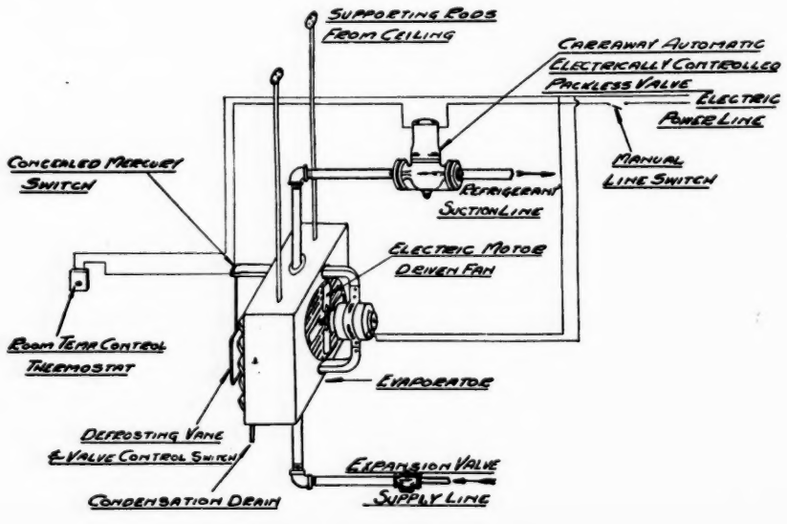
An improved humidity control, the Lewis Humitrol, has been announced by The Lewis Corp., Minneapolis, Minn. The new control overcomes the slowness of the wood element type, gives closer regulation, and is more compact.

The function of the device is to maintain the relative humidity by controlling the operation of a unit which adds moisture to the air. Within the cover is a ribbon type element which expands or contracts with variation of the moisture content of the air. This expansion or contraction is multiplied by a lever mechanism which makes or breaks an electrical contact, starting or stopping a motor, closing or opening a solenoid valve, or operating a magnetic switch.

A tension release pin protects the element against spring tension during times when the relative humidity may exceed 70% due to conditions not under control. The element under excessive humidity may be compared to a steel bar stressed beyond its limit of elasticity. If it were not for the tension release, the control would lose its adjustment.

Range of control is within 3% plus or minus factory setting. Calibrated for 45% relative humidity, the Humitrol will cut in at 42% and out at 48%.

Cover and base are made of aluminum finished in dark baked enamel.



Schwitzer-Cummins Cooling Unit

Electric Controls for Reeves Variable-Speed Transmission

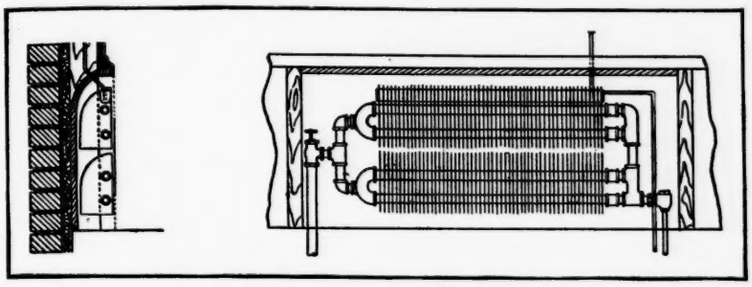
Improvements in the method of providing electric automatic control and electric remote control for the Reeves variable speed transmission have been developed by the Reeves Pulley Co., Columbus, Ind. By means of the electric automatic control the speed of the transmission and, in turn, of the machine or machines to be controlled, may be infinitely regulated over a predetermined range entirely automatically, while the operator of a machine equipped with the remote control may, without leaving his position, accurately regulate the speed of one or more machines merely by pressing a button.

On rotary stoker drives, veneer lathes, paper waxing and waterproofing machines and other installations, the automatic control has increased production, and economized on fuel and raw materials. Absolutely accurate synchronization of a series of machines or of different parts of a single machine is the basis of these production economies. Materials under process are delivered directly from one machine to another with minimum handling and supervision by operators.

Identical with the electric automatic control in every detail but one, the electric remote control puts production regulation at the machine operator's fingertips. Adaptable to any type of machine, this control is especially advantageous where the driving unit is at a distance from the operator. Either type of control may be mounted on Reeves transmissions now in use, and their operation requires no special skill.

Bon-Air Concealed Radiator and Humidifier

A line of concealed radiation which can be furnished with or without a humidifier attachment is being marketed by The Bon-Air Radiator Corporation, Chamber of Commerce Building, Boston, Mass., available in three types. Type O



Bon-Air Concealed Radiator

is exposed, and is adaptable to existing buildings in which it is not desirable to change the wall construction. Type D is constructed of two short sections placed one on top of the other to form a complete radiator, and is used where narrow wall spaces do not permit the use of the extended type. Type N, designed primarily for new buildings, can also be installed in old structures; it has a 10 in. high grille as compared with the 20 in. high grille used with the Type D.

Heating surface is made of Cop-R-Loy coated with a black composition to make it invisible behind the grille. All three types are made in sizes from 3 ft. up to 12 ft. long with capacities from 15 sq. ft. to 60 sq. ft. of steam radiation.

When the humidifier is installed it is mounted on the upper part of the fins. The reservoir is open and the amount of water evaporated from the chamber is controlled by a float valve.

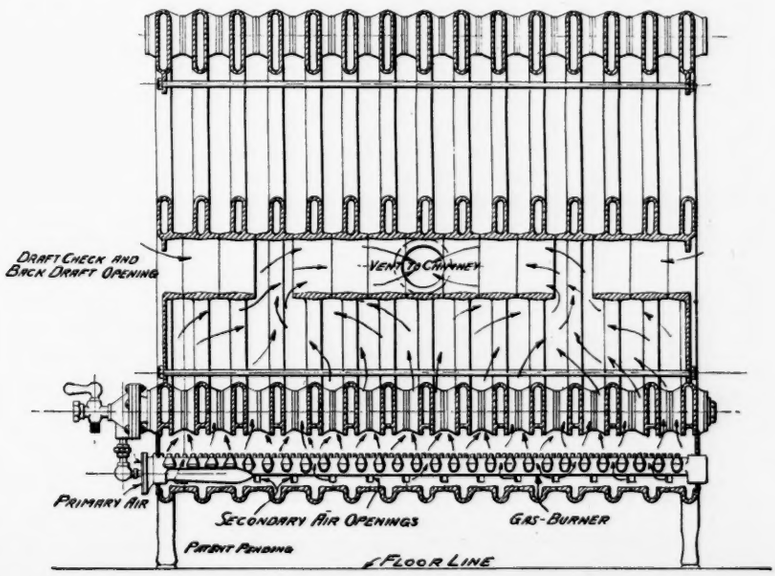
Insulation used with the installation consists of ¾ in. air-cell asbestos. Special grilles are furnished in either special or standard patterns and finishes.

P.I.V. Speed Transmission

The P.I.V. (positive infinitely variable) speed transmission has been placed on the American market by the Link-Belt Co., Philadelphia, Pa.

Basically, the unit consists of two pairs of wheels of the opposed conical disc type, between which a unique chain transmits power. The effective diameters of each pair of wheels can be altered under load to change the speed ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that while the input shaft connected to a motor or other source of power turns at constant speed, the output shaft is brought to the desired R.P.M.

Variable-speed devices employing adjustable conical discs and belts with side friction contacts have been used for some time. The original feature of the P.I.V. gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving discs, and the self-adjustable teeth projecting beyond the sides of the chain are arranged to positively engage the radial teeth of the discs. The unit is in production in five sizes with capacities from 1 to 10 hp.

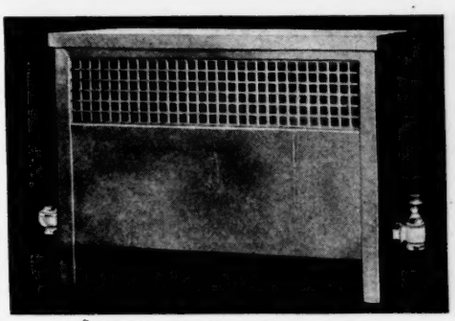


Section of Automatic Gas-Steam Vented Radiator

Freed-Chaud Copper Tube Heat Convector

A line of heat cabinets, known as the Freed-Chaud copper-tube heat convectors, has been placed on the market by the Freed Heater Co., Collegeville, Pa.

Tubes are of rolled seamless copper. Each tube is flanged in a union and screwed to the side section, forming separate steam or water ways. The tubes are so arranged that should any defect develop, caused by some unavoidable accident, each individual tube can be removed without disturbing any other part of the cabinet. Fins on the tubes are corrugated.



Freed-Chaud Heat Convector

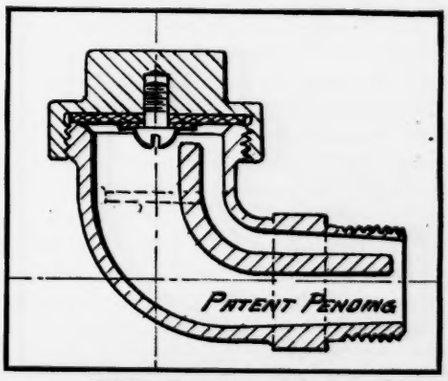
Sizes of the units include 26 models with capacities from 10 to 92 sq. ft. of radiation. Special cabinet can be furnished to meet any specifications of various heights, widths, or capacities.

Vented Automatic Gas-Steam Radiators

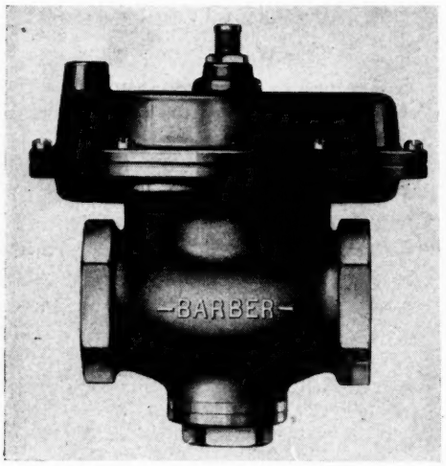
A new feature of the line of gas-fired radiators made by the Automatic Gas-Steam Radiator Co., Pittsburgh, Pa., is that embodied in the combustion chamber which is so baffled as to give the products of combustion a longer fuel travel, thus utilizing more heat before passing out of the chimney. The baffles are shown in the illustration.

These radiators also have a filling cup which eliminates the necessity for a funnel or hose for filling them.

The vented-type radiator is made in seven sizes in the 5 column, 38 in. high type, and seven sizes in the 5 column, 26 in. high type.



Filling Cup for Automatic Gas-Steam Radiator



Barber Superior Gas Pressure Regulator

Barber Gas Pressure Regulator

The Barber gas pressure regulator has been announced by The Barber Gas Burner Co., 3702 Superior Ave., Cleveland, O. This device will regulate upon inlet pressures up to 3½ in. to provide constant outlet pressure down to a fraction of an inch.

The body is of bronze with brass working parts, and springs of phosphor-bronze, with diaphragms of sheepskin. Regulation or adjustment is made by turning the adjusting screw downward to increase the pressure.

Eight sizes are available, ranging from ¼ in. to 2 in., with capacities ranging from 69 to 2088 cu. ft. per hr. at 1 in. pressure drop.

The Steamaker

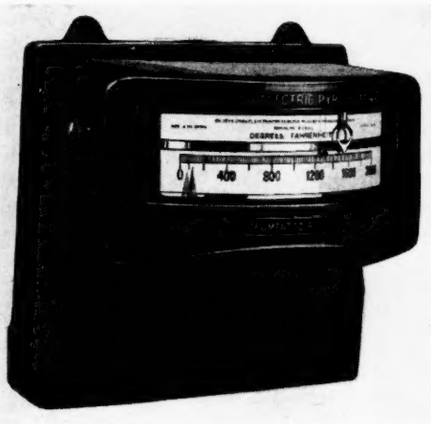
An oil and gas burning heating boiler, manufactured by The Steamaker Co., 22 Clinton St., Brooklyn, N. Y., was exhibited at the Power Show in New York. The unit burns either gas or any fuel oil of 10 to 32 Baume gravity, without changing the adjustment. Whichever fuel is used, an auxiliary emergency supply of the other fuel is available.

In The Steamaker the heat is generated in the upper part of the water body, and this portion of the water boils and produces steam pressure before the remaining portion has become warm. The steam is dry because the heat is so intense in this upper part of the boiler that the water is flashed into steam from the immediate surface of the water and this steam then passes over hot pipes from the combustion chamber, which removes the moisture and superheats the steam.

The heating unit of The Steamaker comprises a water preheating section surmounted by the burner and combustion chamber section. The entire heating unit is water-jacketed and well insulated. Water at the top of the generator remains close to the boiling point for many hours after the fuel supply has been cut off. Control is either manual, semi-automatic or automatic.

Combustion takes place in a completely enclosed horizontal cylindrical chamber extending lengthwise of the generator and placed near the top, just under the water line. Fuel and air, in exact correct proportions, always under positive control as to volume and pressure, are forced through the combination oil and gas burner into the combustion chamber under low pressure, air about one pound, oil about four pounds. The burner is completely enclosed and has no moving parts. The flame produced extends about two-thirds the length of the combustion chamber.

The only moving part is a small electric motor directly coupled to an air compressor and oil pump.



Brown Indicating Pyrometer Controller

Indicating Pyrometer Controller

A Model 801 indicating pyrometer controller has been announced by The Brown Instrument Co., Philadelphia, Pa. It can be supplied as an automatic control pyrometer, resistance thermometer, tachometer, or CO_2 meter.

Some outstanding advantages of this instrument are: the reading is observed directly on a 6 in. scale. There is an index on the scale for setting to exact control point, and the control point is instantly and easily adjustable. All wiring terminals and motor enclosed.

Mercury switches up to 30 amperes capacity, eliminate the necessity of relay equipment. Make and break occurs in sealed glass tube, so that there is no danger of spark causing explosion.

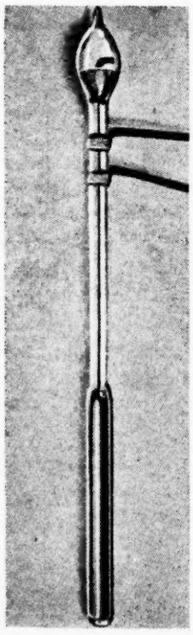
Struthers Dunn Thermo Regulator

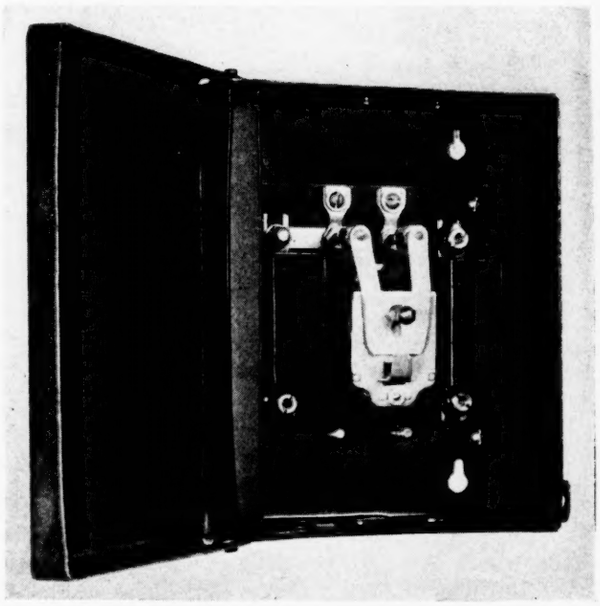
A mercury Thermo Regulator has been announced by Struthers Dunn Inc., 139 North Juniper St., Philadelphia, Pa. The instrument is designed to respond to variations in temperature as small as 1/10°.

The glass tube shown in the accompanying illustration is the room temperature control, and operates in connection with the relay. The Thermo Regulator can be adjusted for any temperature between 0° and 300° as follows:

The lower bulb is heated to a point equal to the sum of the temperatures, plus a setting factor that is engraved on the stem of the instrument. This forces the excess mercury out of its stem and into the storage bulb at the top. When the instrument is cooled to the working range, the mercury breaks contact with the upper electrode at precisely the point desired.

For a lower setting, the instrument is heated in a horizontal position until the mercury thread makes contact with the pool in the storage bulb. By reducing the temperature, the mercury is drawn back into the stem, so that the lower the setting, the more mercury is in the stem.





Struthers-Dunn Thermo Regulator

Quick-Freezing Pipes for Repairs

A quick and handy method of freezing pipes for shut-off in order to make repairs has been developed through the use of solid carbon dioxide, most widely known under the trade-mark, Dry-Ice, made by the Dry-Ice Corp. of America, 52 Vanderbilt Ave., New York.

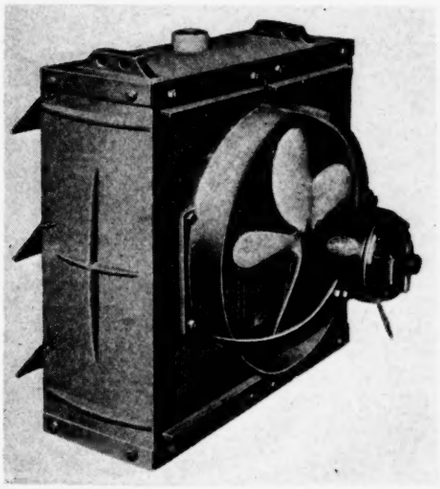
Dry-Ice, at 109.6° below zero, is so cold that large water mains can be easily and quickly frozen, and thus completely blocked, through its use, even when under ordinary water pressure. Twenty minutes is long enough to freeze a 2 in. water line in service. In the same way lines carrying many other liquids, including practically all water solutions, the common acids and most of the other liquids usually handled in industrial plants may be temporarily blocked by freezing. There are, of course, exceptions. Alcohol, ether, acetone and a few other solvents cannot be frozen in this way.

The method consists in packing a quantity of Dry-Ice, either cut or broken into pieces of convenient size, around the pipe on the pressure side of the proposed break. After the work has been done, only a short time is required to allow the pipe to thaw and resume service. The method can be applied to lines while in service and the shut-off is practically no longer than is required to do the job itself.

The quantity of Dry-Ice required varies rather widely, depending on the pipe size, temperature, time and other obvious factors, but in general the cost of the method has been found to be low when time of shut-down is an important item.

Chaud Unit Heater

The Chaud unit heater is being marketed by the Freed Heater Co., Collegeville, Pa. The heating surface is composed of copper tubes with square brass fins. Each heater has from 88 to 112 tubes, 4 rows deep, and from 20 to 25 in. long.



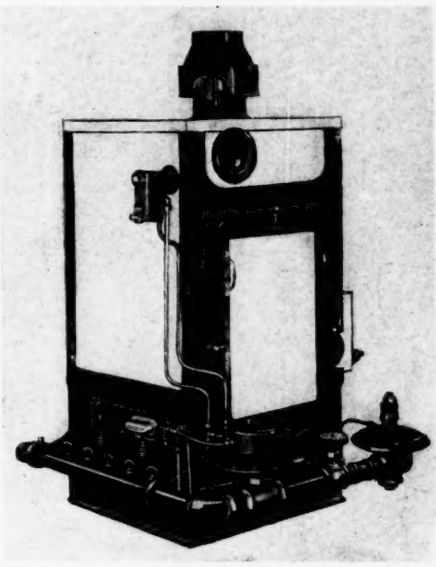
Rear View of Chaud Unit Heater

The casing is made of gray iron while the motors are standard make. The joints of the heating surface are electrically fused, and seamless tubing is employed in the construction.

The units are available in 5 sizes, with ratings ranging from 200 to 800 equivalent sq. ft. of radiation at 60°.

Peerless Gas Boiler

Easily opened clean-out doors giving access to flues from both sides of the boiler and patented water-tube construction are claimed as exclusive features of the Peerless Super-Section gas boiler exhibited at the Atlantic City convention of the American Gas Association by the Peerless Heater Co., Boyertown, Pa.



Peerless Gas-Fired Boiler

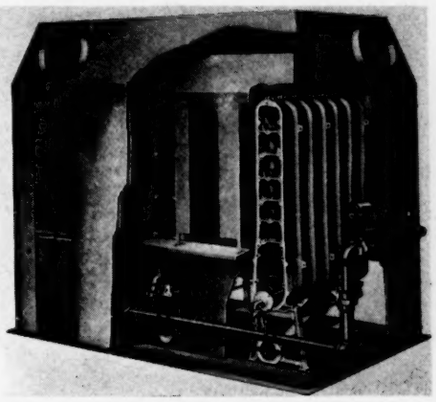
Handled panels in the jacketed sides of the boiler are quickly removed by simply loosening three lug nuts, thus exposing the entire flue construction. Impurities deposited on section surfaces may be easily brushed away.

Peerless Super-Section boilers are built in two sizes—three inch and five inch sections—with capacities ranging from 540 to 12,200 sq. ft. water rating and from 330 to 7625 sq. ft. steam rating.

Standard equipment includes: Automatic gas supply valve and thermostatic pilot. On water boiler, high water temperature cut-off and combination altitude gauge and thermometer. On steam boiler, low water line safety cut-off, steam pressure throttle control, steam pressure gauge and standard A.S.M.E. safety valve.

Fox Gas Automatic

A gas-fired warm-air furnace with blowers and filters has been placed on the market by the Fox Furnace Co., Elyria, Ohio. The units are equipped with blower and motor, air filters, a Mercoid blower control, shut-off valve, gas-pressure regulator, and can also be supplied with room thermostat, motor valve, safety pilot and automatic humidifier.



Fox Automatic Gas Furnace

Six sizes are available, with input ratings ranging from 70,000 to 420,000 B.t.u. per hr., and with net available ratings at the bonnet ranging from 59,500 to 357,000 B.t.u. per hr. The sizes range from 15 in. wide, 59½ in. high and 87 in. deep for the B-1 heater to 90 in. wide, 59½ in. high and 87 in. deep for the B-6 heater.

Thatcher Gas-Fired Boiler

A line of gas-fired boilers finished in scarlet and black baked enamel has been announced by The Thatcher Co., 39 St. Francis Street, Newark, N. J. A feature of the boilers is the clean out panels for easy access to the flues. flues.

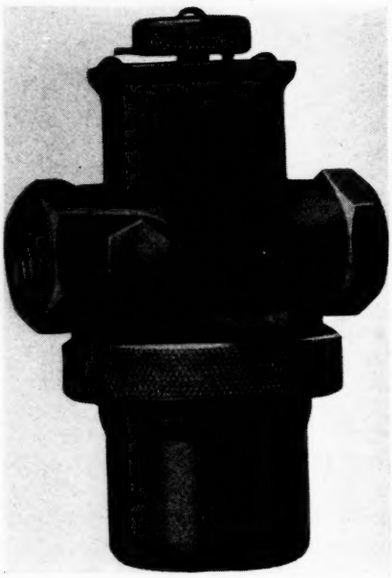
Ratings range from 315 to 2330 sq. ft. of steam radiation in 15 sizes in the 3 in. section type and from 1335 to 7120 sq. ft. in 17 sizes in the 5 in. section type. Ratings given are A.G.A. capacities.

Merco Swivel Flange

A flanged joint for use in connection with welded pipe lines, where such a joint is required for the insertion of valves and fittings, is being marketed by the Merco Nordstrom Valve Co., 343 Sansome St., San Francisco, Calif. The device is known as the Merco Swivel Flange.

It is said that the flange possesses the flexibility of the Vanstone type of flange in addition to the strength of an ordinary butt-welded flange. It consists of a drop-forged steel flange fitted to a drop-forged tapered nipple on which the flange can be rotated to permit alignment of bolts.

The flange is in production in sizes ranging from 1½ to 10 in. diameter, and can be furnished with pipe nipples of various lengths welded on.



Temp-O-Stat Temperature Control for Gas Appliances

Temp-O-Stat Individual Room Temperature Control

Temp-O-Stat is the name of the individual room temperature control recently announced by the Time-O-Stat Controls Company, Elkhart, Ind. It is designed for use in residences, schools, churches and stores, wherever gas-fired space heaters are used.

Incorporated in the Temp-O-Stat is a gas-filled bellows which expands or contracts with the changes in room temperature. It is the action of this bellows that controls the gas supply to the heater within a 4° difference in room temperature. A knob located on the top of the control can be easily adjusted to maintain the desired temperature.

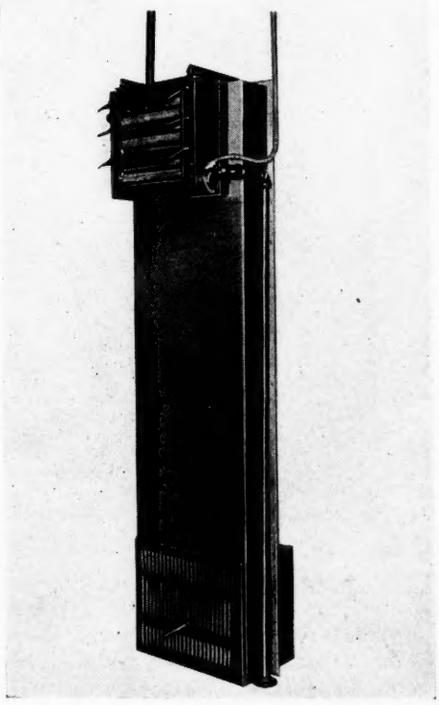
The Temp-O-Stat has a capacity of 70,000 B.T.U. of 0.6 specific gravity gas with pressure drop of only 0.4 in. It has an inverted valve seat which eliminates the possibility of clogging. The unit is equipped with a by-pass for minimum frame adjustment and with ample port area for domestic and commercial types of gas fired equipment.

Wolverine Cabinet Unit Heater

A cabinet unit heater has been announced by the Wolverine Tube Co., Detroit, Mich. It provides an intake through the wall of the building as an alternate source of air. A straight, square damper permits either one or both air inlets to be used at the same time. Summer ventilation with outside air is therefore possible as well as winter ventilation with inside air.

Immediately above the air inlets is a steel wool air filter, removable for cleaning. The capacity of the vertical flue or cabinet is sufficiently great so that the full action of the unit heater, mounted at the top, is not interfered with.

A standard Wolverine unit heater is used, with individually adjustable louvers, and an off and on switch. The cabinet has a flush, panel door through which the motor of the heater may be reached. Seamless copper tubing with copper fins runs in single lengths from multiple bronze inlets to multiple bronze outlets. There are no joints except the end connections and these are silver soldered. The tubing is arranged horizontally in non-abrasive saddles and at such an angle as to be completely self-draining. These full floating coils automatically take care of expansion and contraction. The unit is designed for hot water, vapor or steam and is considered serviceable even on high-pressure lines.



Wolverine Cabinet Unit Heater

Veneeray Invisible Radiant Heating

First installed five years ago, Veneeray invisible accessible radiant heating systems are being installed by Young, Austen and Young, engineering contractors, in London, Liverpool and other English cities. This firm is the sole licensee for the system in that country. Veneeray comprises special flat faced radiator units covered with hard sheets, called Veneer sheets, made of any good conductor. These sheets are held in place by mechanical fixings. In the case of steam heating systems, a patented arrangement of spacing strips is added to the back of the sheets to grade the temperature required on the faces of the heated surfaces.

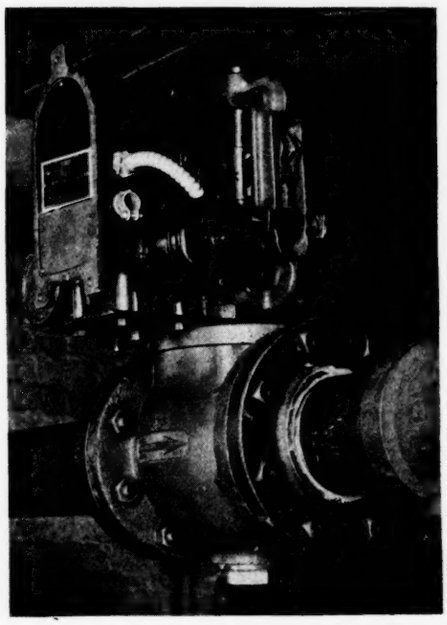
Expansion is provided for by the fact that the clips or other mechanical fastenings, invisibly fixed on the back of the veneer sheets, are so arranged that expansion is directed to the edges of the sheets where the mouldings or beads hold the edges in position; in addition, patented resilient mountings are used for fixing the heat units to take up any expansion on the connections and any expansion of the heated veneer sheet between the back of it and the face of the units, and no cracking of the painted or other finish has been experienced.

Veneeray heating has a further advantage in that it gives freedom of design from an architectural point of view. In certain cases, oak, walnut, or other thin-face veneers can be superimposed on certain types of "hard" sheeting for use in special panelled rooms, the superimposed "face" veneer being matched to the oak or other panelling being used by the architect.

Stat-Amatic Motorized Valve

A motorized valve for the control of pipe lines has been placed on the market by the Stat-Amatic Instrument & Appliance Co., Hartford, Conn. The illustration shows an actual installation.

The motor can be so mounted that it occupies practically the same room as the yoke on the valve, and mounted free from the valve. The gear reduction train, between the motor and the valve, runs in oil. The whole mechanism is remarkably quiet. The motor shown in the illustration is also used for operating drafts and dampers and gas lever operated valves.



Stat-Amatic Motorized Valve

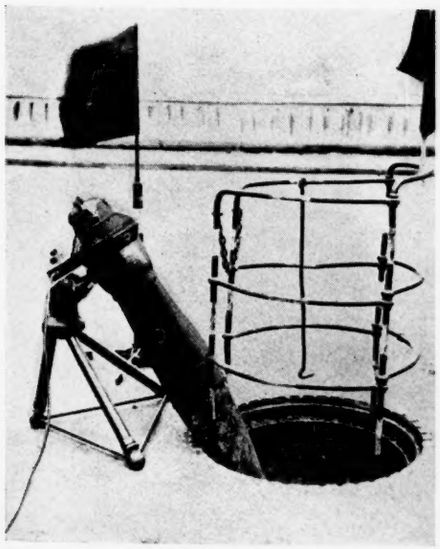
Rapid Method of Expelling Sewer Gas

A quick and efficient method of overcoming the hazards of manhole work by expelling accumulation of carbon monoxide gas is accomplished by the Coppus Vano blower manufactured by the Coppus Engineering Corp., Worcester, Mass.

The equipment itself is a propeller-type blower of unique design and construction and which is now used extensively in manufacturing plants for process work, exhausting tanks and boilers, ventilating purposes, cooling and drying operations.

One of the features of the device is the application of stationary guide vanes of peculiar design beyond the propeller. The air current leaving the propeller is radially subdivided by the individual guide vane blades and taken up by them without shock. The guide vane blades, which have a curvature increasing in the direction of rotation of the propeller, concentrate the air current and give it a further acceleration inside of the stationary guide vanes so that a considerable part of the pressure is produced in the latter. A large part of the end thrust is thus taken up by the stationary guide vane casing. The air streams, into which the flow of air has been subdivided by the guide vane blades, leave the guide vane casing, on account of the kinetic energy, slightly rotating and convergent toward the axis so that the smallest section of the air flow is reached beyond the guide vane casing. This makes the blower efficient for use with hose extension as employed in sewer work.

Another advantage found in the employment of this equipment is its light weight and portability; weighing less than 100 lb., it can be quickly set up and placed in operation by one man. Attachment for the electric current is made at any convenient outlet. This overcomes the inconvenience of the gas engine which in itself produces additional carbon monoxide gas.

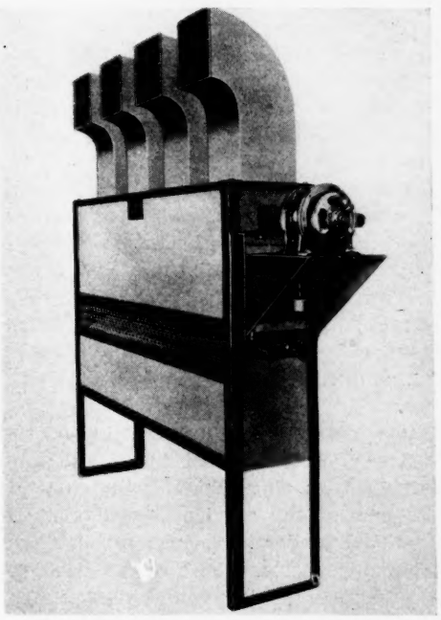


Coppus Vano Blower

York Announces the Super-Control Heat-Diffusing Unit

Announcement has been made by the York Heating & Ventilating Corp., Philadelphia, of a unit known as the Super-Control Heat-Diffusing unit. The unit embodies new control features which, it is stated, result in greater efficiency.

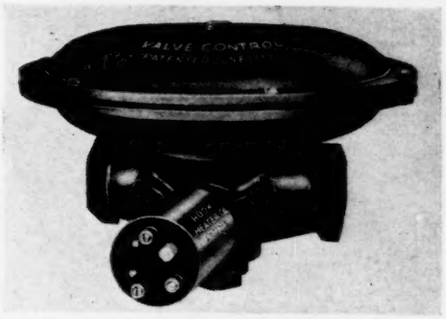
The principle of operation is that the necessary heat output of the unit shall be mixed with room temperature air within the heater so that the resulting mixture is always held at the lowest possible final temperature consistent with producing the required room temperature. In effect, a sliding scale of leaving air temperature is achieved which is always balanced to meet heating requirements. It is pointed out that an air stream carrying the necessary heat content is most easily held in the lower areas when the temperature of the mixture is maintained at the lowest possible temperature. The hotter the leaving air stream, the more vigorous is its tendency to rise. By tempering the heated air within the heater it is possible to reduce this tendency to a minimum.



York S-C Heat Diffusing Unit

The same principle of high velocity discharge has been followed as has been a feature of York units in the past, the statement being made that high velocity combined with the least possible tendency of the heated air to rise, results in a long horizontal movement of the leaving air and permits it to spread more evenly.

No throttling of the steam valve is necessary with the new S-C unit.



Hook Shut-Off Valve

Combination Regulator and Shut-Off Valve

A combination pressure regulator and shut-off valve for use with gas-burning appliances was exhibited at the recent A.G.A. convention by the Hook Heater Co., Pittsburgh, Pa. The unit is said to have a B.T.U. input on the 1¼ in. size greater than that of any separate units.

At 0.5 in. pressure drop the device passes 520,000 B.T.U. of gas per hr. The control can be either manually or electrically operated.

The unit is positive in action, either as a regulator or shut-off valve. It is said to eliminate the hazard of guesswork in the adjustment of gas burner equipment, any error due to the ability of the personnel, and reduces the pressure drop through the entire system. It simplifies piping, and reduces installation cost. Two elements are combined, each containing movable and adjustable parts, in a unit which is completely enclosed, and has less mechanism than either one of the two units in common use. It eliminates bleeding gas lines, and can be operated either manually or electrically.

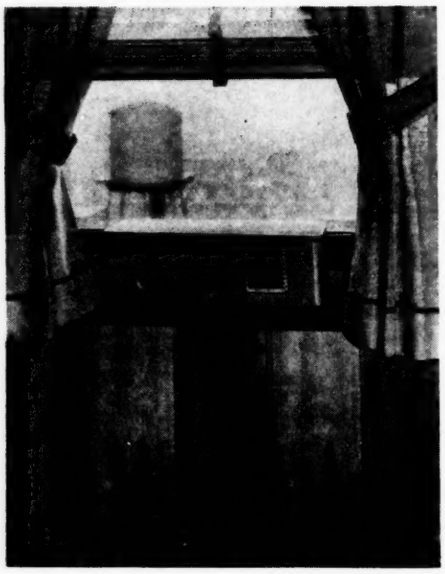
The valve is so designed that in the event of current or gas failure, it automatically resumes a shut-off position. After current is resumed, it automatically resumes its normal position.

Tests have shown that the unit regulates pressure within 0.3 in. with a rise of from 3½ in. to 5¼ in. pressure.

American Fan-Filter Unit

A blower and filter unit designed especially for gas converted systems, is being marketed by the Gas Division, American Foundry & Furnace Co., Bloomington, Ill. The air filters can be cleaned when necessary with an ordinary vacuum cleaner.

The blower is a double-width, double inlet centrifugal type, adjustable for two speeds. The fan is driven by a General Electric Capacitor motor set on separate base. Canvas connections are used between the blower and housing, and the filters are easily removed to the side of the housing.



Airgard Installed in Office

Airgard-Combination Ventilator and Air Cleaner

Airgard, a compact mechanical ventilator for use in offices and homes, has been introduced by the American Air Filter Co., Inc., Louisville, Ky. Incoming air enters the device through a silencing passage which practically eliminates outside noises to the point where no more sound will enter through the Airgard than through a closed window. As the cover is raised a damper automatically closes the intake passage, making it possible to recirculate all or any part of the air in the room during the winter months by merely varying the elevation of the hinged cover.

Twin blowers of the double-inlet type direct connected to a fractional horsepower motor are used. Airmat filtering material is used to clean the air. The Airmat sheet lies flat directly beneath the cover and rests upon a horizontal screen support. When a sheet becomes soiled it is lifted out and replaced with a clean one.

The Airgard ventilator is 24 in. long, 7½ in. high and 9 in. deep, and has a capacity of 150 c.f.m., sufficient for ventilation in the average room or office.

Airgard can be employed for the ventilation of private offices, particularly in the congested downtown or industrial districts where dust and noise preclude the use of open windows, in laboratories, and in the home or hospital. It may also be used as a heat booster for the hard-to-heat room. Placed on the radiator it creates positive circulation of the heated air, at the same time removing the dust and soot that soil walls and draperies. A special humidifier designed for use with the Airgard may be used to add the much needed water vapor to the dry heated air.

Adjustable outlet louvers make it possible to deflect the air in different directions, thus preventing drafts. The unit is finished in dark green crackle effect, and furnished complete with the necessary blocks and felt strips for window installation, ready to operate, for either 115 volt d.c. or 110 volt a.c.

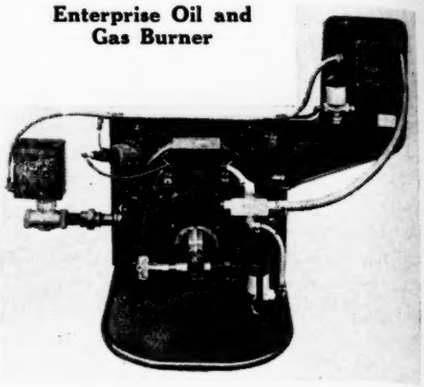
Burner for Oil and Gas

Enterprise Oil Burner Co., San Francisco, Cal., has announced a new combination oil and gas burner for domestic use, which is known as the Junior "W." It will burn No. 3 or lighter fuel oil, natural or manufactured gas. Three distinct methods of operation may be secured with this burner, depending upon the cost and kind of fuel available at the place of installation. It will burn gas only in cheap natural gas districts, oil in favorable oil burner territories, or either fuel in localities where gas and oil are competitive. All three methods of operation are entirely automatic and controlled by a standard thermostat.

When gas only is to be used the oil pump is easily removed by loosening two screws. The gas burner is removed when oil alone is to be fired. Gas and oil can be alternately burned by means of the combination equipment. Full electric ignition is used when burning oil, and full electric-gas ignition with gas.

Gas enters the furnace through a series of holes drilled in the circumference of a ring which is mounted at the end of the air blast tube. Oil is admitted under pressure through an atomizing nozzle. The air supply enters between the gas ring and the oil line at the center. Before entering the furnace the gas is mixed with ten parts of air to one part gas. There is also a shutter regulation on the burner to regulate the amount of air delivered to the burner nozzle.

Enterprise Oil and Gas Burner

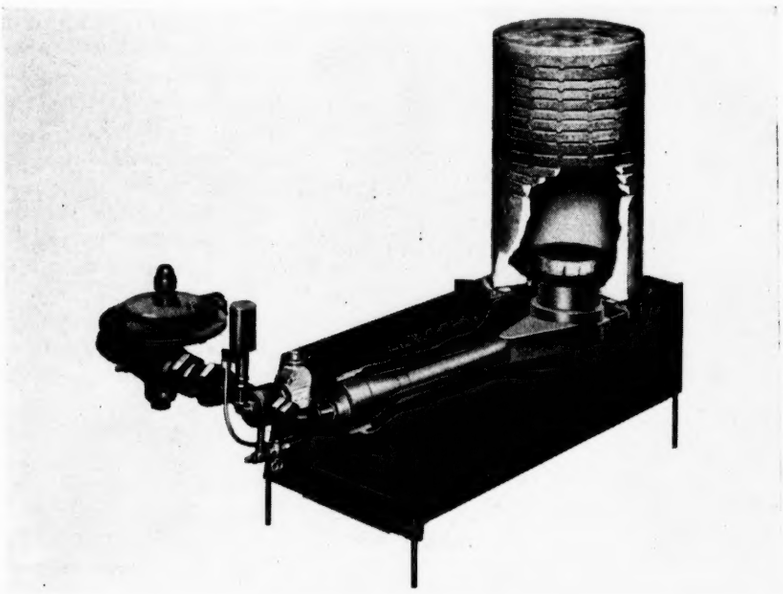


This new burner is the domestic addition to the company's line of industrial gas burners which has been made for some time. An industrial gas burner has been developed to fit all models of standard Enterprise oil burners.

Republic Gas Burner

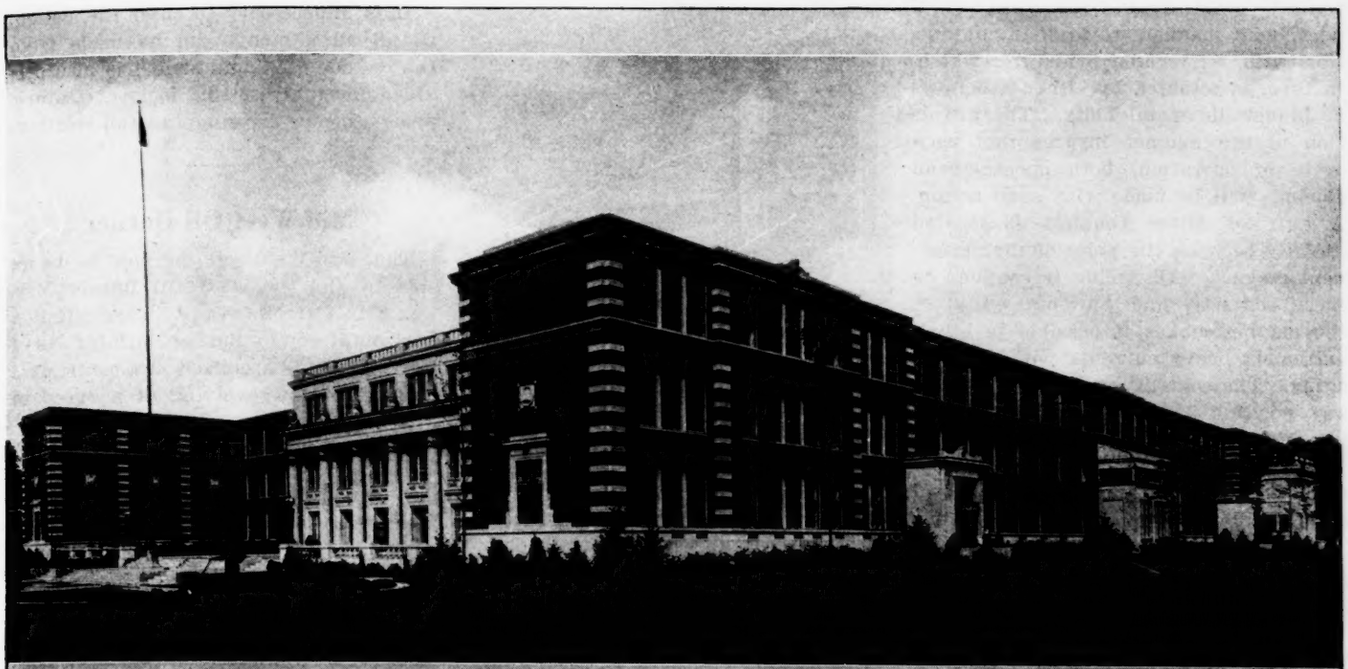
A gas conversion burner is being sold by the Autogas Corp., 2258 Diversey Parkway, Chicago, Ill., under the trade name Republic. It consists essentially of a metal container at one end of which is the burner head and the stack of radiant refractories and at the other end the mixing chamber and regulating devices.

The burner head is unique in that the gas burns in a continuous sheet of flame around the burner head and inside the refractory base ring. The burner head is surrounded by a solid refractory base ring surmounted by a series of refractory rings forming between them a series of slots. The top member is a perforated refractory plate. The entire refractory chamber develops incandescence with a high degree of radiance.



Republic Gas Burner

The Shortridge High School



INDIANAPOLIS, INDIANA

DURING the past 30 years many of the most prominent schools in Indianapolis have been equipped with the Powers System of Automatic Temperature Control.

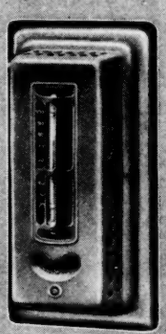
Because of its unequalled record for long life and accurate control in schools built as far back as 1898, Powers Regulation was installed in the new Shortridge High School.

To get the biggest return on the investment in heat control—install POWERS Regulation. It costs more. It's worth more—because of the following reasons:

Architects
KOPF & DEERY

Consulting Engineers
SNIDER & ROTZ

Heating Contractors
FREYN BROS.



(1) It often gives 15 to 20 years of Accurate and Dependable control without repairs of any kind.

(2) Greater Steam Economy due to the fact that thermostats do not get out of adjustment and permit overheating.

(3) Greater Comfort and Health of occupants of rooms—temperature is not too hot nor too cold—but just right.

(4) A minimum of Service Calls and the trouble and annoyance connected with them.

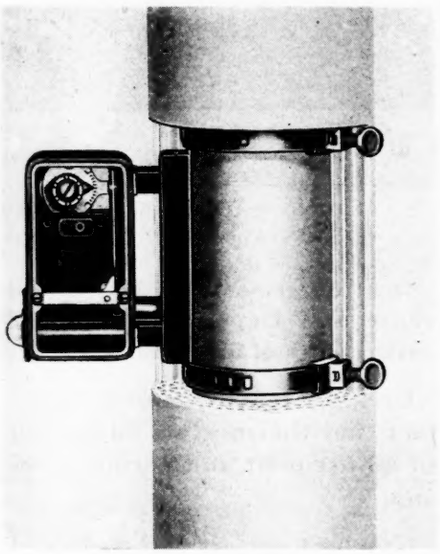
THE POWERS REGULATOR CO.
2718 Greenview Ave. CHICAGO
137 E. 46th Street NEW YORK
Offices in 37 other cities

POWERS

Penn Electric Switch Announces New Controls

A new line of controls has been announced by Penn Electric Switch Co., Des Moines, Ia. All employ a patented contact construction, consisting of a permanent magnet, working in conjunction with a movable armature, which, in turn, is actuated by either a bellows or bi-metallic metal helix. The attraction of the magnet insures that each cycle of operation, both opening and closing, will be made with snap action. A pair of silver contacts is located directly between the poles of the permanent magnet. All arcing is confined to these contacts, and blow-out effect of the magnet makes it possible to break extremely heavy currents without damaging. The controls can be mounted in any position and are not affected by vibration or motion.

The switching structure of all controls described is housed in the Bakelite case, and are light, durable, and compact.

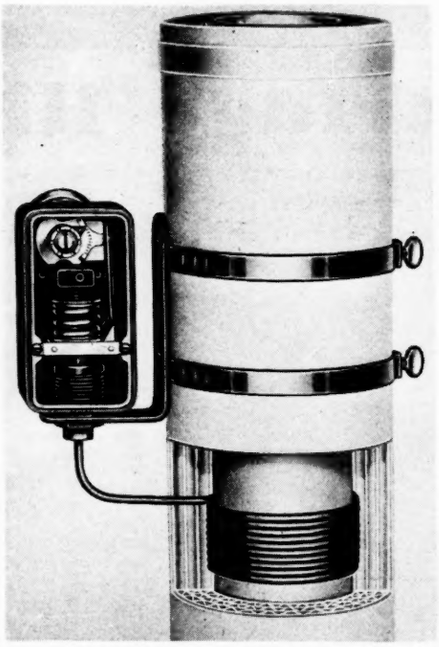


Type JRB Penn Surface Water Limit Control

The case is 4⅛ in. x 2⅛ in. x 2 in. The controls are listed to carry either a.c. or d.c. motors up to and including 1/3 hp. A suitable conduit box housing terminal binding posts is provided for ease and accessibility in wiring.

The type J, model JRP, control is a steam pressure safety limit switch. The minimum differential is approximately 1½ lb. By means of differential adjuster, the differential may be widened as desired. It may be adjusted so that the pressure may be raised or lowered to cover the entire range of steam boiler applications.

The type J, model JRB, is a surface safety limit switch designed to cover any application connected with the limit of hot water steam boilers. It is necessary only to strap switch against riser. The bi-metallic metal enclosed in the brass housing acts as motive power to trip the switch with fluctuations in temperature.

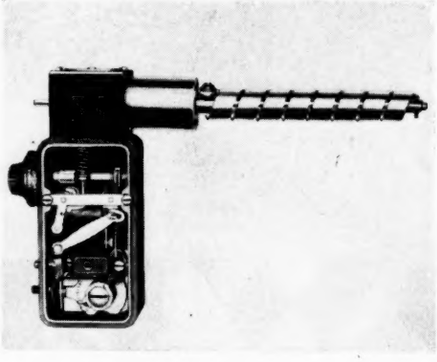


Type JRT Penn Water Limit Control

The control is provided with an outside adjusting means so that the safety limit setting may be raised or lowered as desired. It also incorporates a differential adjusting feature, by which the opening and closing points can be decreased or increased as desired.

Type J, model JRT, is a hot-water safety limit switch for controlling the temperature of hot water systems from the riser. A bracket and necessary straps for convenient mounting are furnished. Differential and range may be adjusted to cover all applications connected with hot water limit control. Changes in temperature act upon bellows to actuate the switching mechanism.

Type J, models JH and JHR, are furnace and fan safety limit switches. They are provided with outside adjusting feature, by which the range and differential may be regulated to control any application connected with the safety limit of warm-air furnaces over the entire range of from 100° to 600°.



Type JS Penn Stack and Lock Safety Control

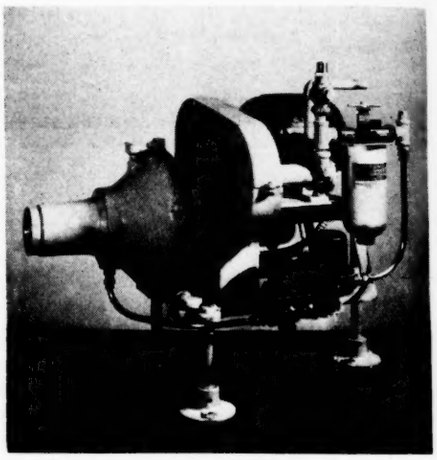
Type J, model JS, is a stack and lock safety switch with which, by means of a convenient control knob, the timing of the safety feature may be varied from a few seconds to several minutes, depending upon conditions.

It is unnecessary to enter the switch, as all adjustments can be made from the outside. A hand switch is also provided for the resetting lock-out feature, or as a means for stopping and starting.

Mid-West Oil Burner

The Mid-West oil burner is being sold by the Mid-West Oil Burner Mfg. Co., 3227 Carroll Ave., Chicago. It is a horizontal rotary burner, burning No. 4 fuel oil. Oil is atomized in a centrifugal atomizing cup revolving at a speed of 3450 r.p.m.

Oil is fed under pressure which is



Mid-West Oil Burner

normally from 6 to 20 lb. to the oil jet inside the burner housing, and inside the oil atomizer cup by means of pressure regulated by the pressure valve. The oil passes through an oil strainer, oil filter, two solenoid oil control valves into the oil jet. The first solenoid oil valve is the positive shut-off for safety, the second has a high and a low adjustment which is set by the installer. Gas ignition is used.

When thermostat calls for heat and contact is made starting the motor and the oil pump, No. 1 oil valve opens, permitting the oil to go through the bypass in second so'enoid oil valve, the gas valve expands the pilot light and ignition takes place. In a short time the second solenoid valve opens, allowing the maximum flow of oil which is controlled by a metering valve, the gas expansion valve closes, the fire continues to burn on high until thermostat or pressure regulating valve on the boiler reaches the desired heat or pressure at which the controls are set.

Insure
Better Performance

By Specifying

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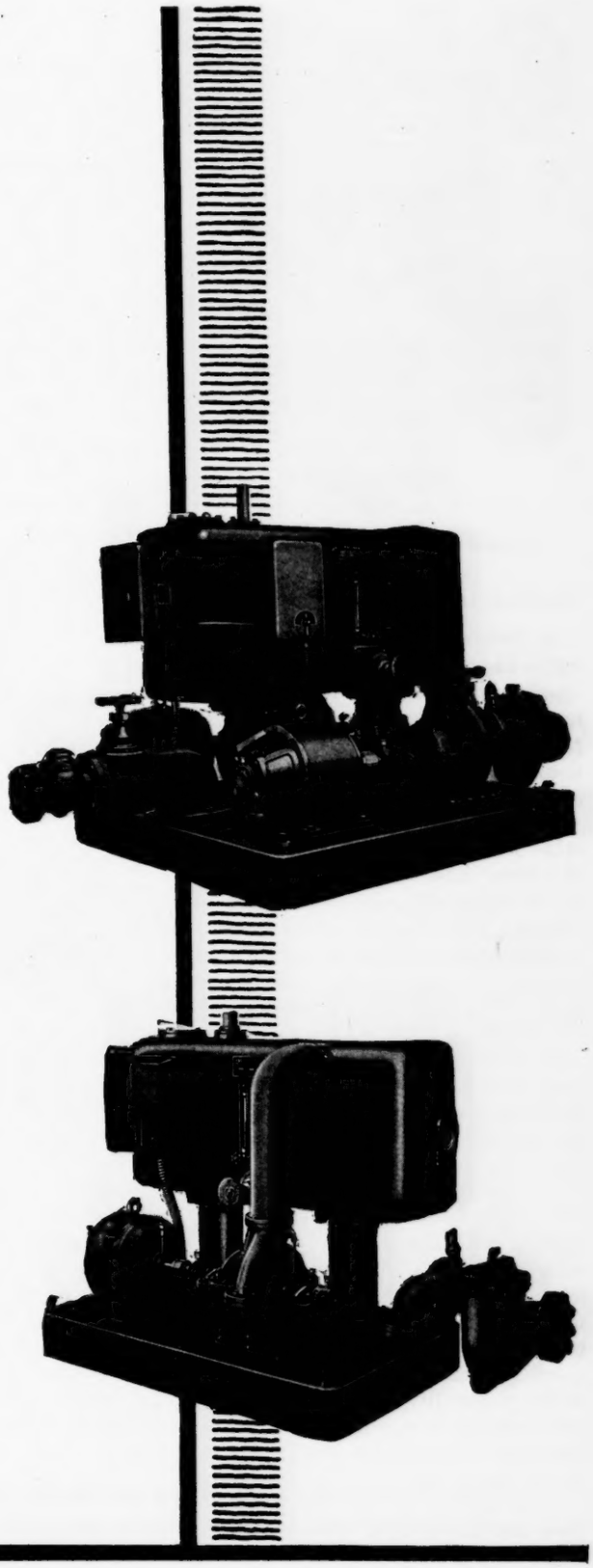
Vacuum Pump



AMES PUMP COMPANY, Inc.
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Affiliated with
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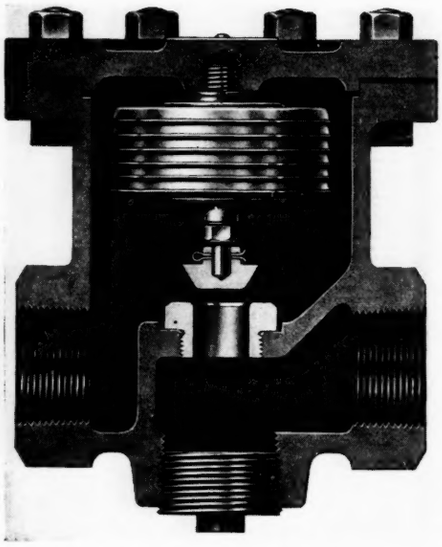


Section of Nicholson Steam Trap

Nicholson Industrial Steam Trap

A bellows-type trap, embodying a balanced-pressure principle with quick opening and closing without wire drawing, has been announced by W. H. Nicholson Co., Wilkes-Barre, Pa. It is suitable for use with heating systems and process steam applications.

The actuating element consists of a large diameter bellows suspended from the cover and carrying the valve disk on the lower side, as shown in the illustration. The pressure on the inside and outside of the bellows is said to remain constant for any steam pressure and the trap will operate without adjustment on any pressure from 0 to 100 lb.

As long as steam is present in the trap, the valve remains closed owing to the internal and external pressure on the bellows being in a balanced condition. The presence of water in the trap dissipates the internal pressure and the valve opens owing to the pressure difference established. As the valve is wide open when cold, any air that collects in the trap and piping is automatically discharged when the steam is turned on.

An important feature of the design is the possibility of using it either as an angle or straight-through trap by changing the pipe plug from the bottom connection to the side and vice versa.

Capacities in pounds per hour range from 545 lb. at 0 lb. pressure to 7,720 lb. at 100 lb. pressure for the ½-in. trap and from 4,970 lb. to 70,500 at corresponding pressures for the 2-in. size.

Robertshaw Type 2E Thermostat

Due to an error, the illustration of the Robertshaw type 2E thermostat which appeared in the September issue of HEATING AND VENTILATING was accompanied by a description of an obsolete model made by that company.

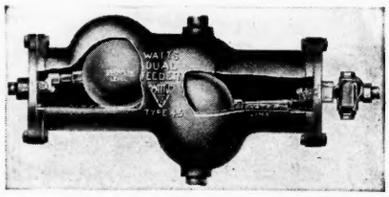
The model 2E thermostat, made by the Robertshaw Thermostat Co., Youngwood, Pa., is designed for gas-fired space heaters. It is a single unit throttling-type thermostat, made for ½, ¾, and 1 in. pipe, and is designed for installation in the gas line to the room heater.

The thermostatic element is a Sylphon bellows which is fully exposed to the atmosphere, and controls the room temperature to within plus or minus 1°. For parlor heaters it is set between 60° and 80° with 70° at normal. For garage heaters it is set between 40° and 60° with 50° at normal.

The valve portion of the unit is white nickeled with the smooth surfaces highly polished. Bellows and bellows casing are finished in crystal bronze Duco. Advantages are in the sturdy construction, close temperature control, ease of installation and moderate price.

Watts Boiler Water Feeder

A boiler water feeder has been placed on the market by the Watts Regulator Co., 250 Lowell St., Lawrence, Mass. The feeder supplies water to the boiler



Watts Boiler Water Feeder

automatically as needed, but prevents high water or flooding of the boiler. When large volumes of condensation are returned suddenly at intervals to the boiler, the overflow valve discharges the excess water to the sewer.

When the water level in the boiler drops, a float opens the feed valve and admits just enough water to raise the level to normal. The feed valve is above the normal water line. When it is open slightly, a curtain of water is sprayed out at a high velocity against all parts of the feeder to wash them clean.

The heavy float is made of seamless, non-corroding copper. The buoyancy of this float, increased by the leverage of the float rod, will close the valve tight against 300 lb. water pressure.

The feeder is made in two sizes, types 42 and 43. The capacities range from 2400 to 7800 sq. ft. of radiation with a difference between the steam and water pressures ranging from 10 to 100 lb.

Air-O-Cel Insulation

An insulating material, known as Air-O-Cel, is being marketed by Air-O-Cel, Inc., General Motors Bldg., Detroit, Mich. The material employed is a waterproofed wood fiber board of corrugated type, approximately ¼ in. thick. Each sheet is slotted at the corner, and scored or creased near the edge in both directions to facilitate folding into a box-like shape in which it is applied. The material has the effect of dividing the air space between the sheathing and plaster into a series of air-tight boxes of double or triple thickness, dependent on the type of installation selected.

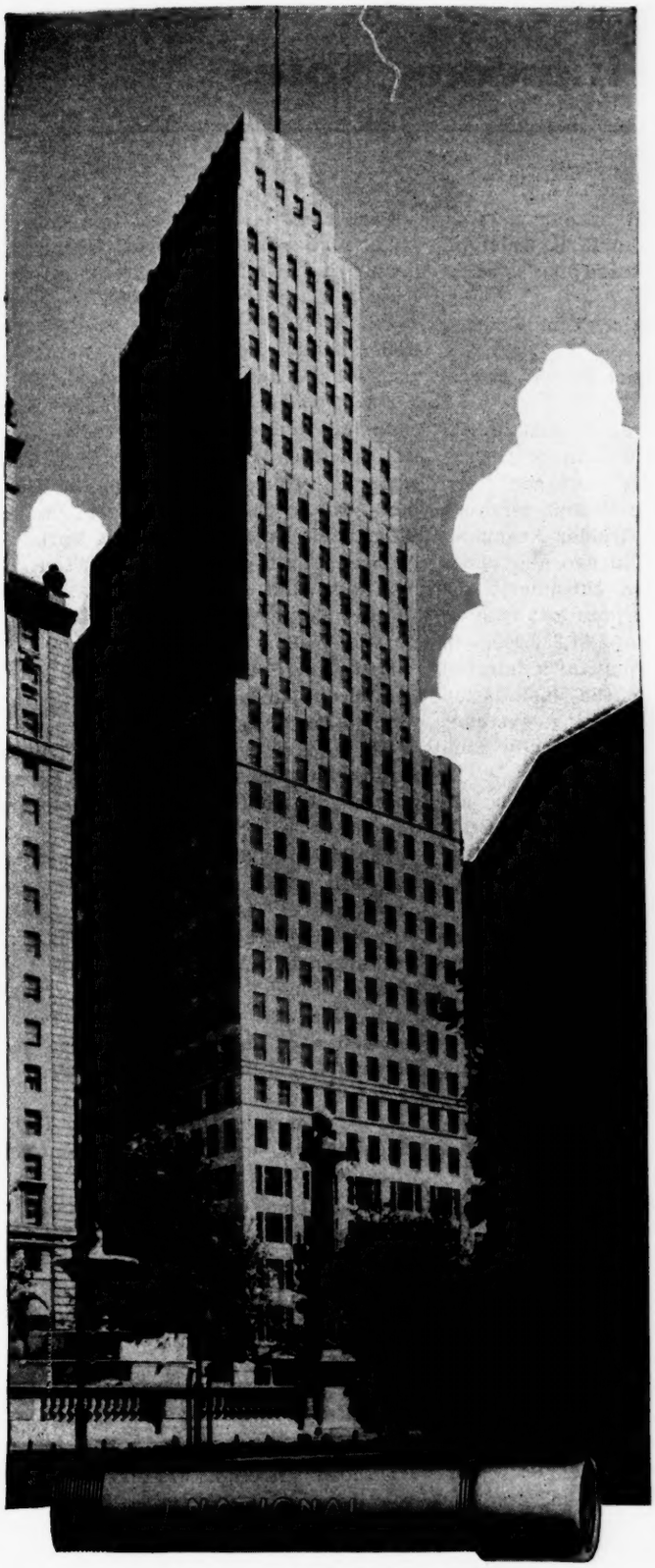
The material comes in flat sheets in three sizes: 17 in. x 57 in., 17 in. x 51 in., and 25 in. x 51 in. The first two sizes are designed for use with studding or joists spaced 16 in. on center and under, and the third size takes care of all studding or joists spaced from 16 to 24 in. on center.

Sangamo Time Switch

A time switch which has many applications in domestic, commercial and industrial oil burner installations has been introduced by the Sangamo Electric Co., Springfield, Ill. The switch is so arranged that the Hamilton-Sangamo electrically-wound clock trips a mercury switch. The mainspring in the clock mechanism is kept wound to a constant tension by a noiseless clock motor. The switch mechanism is motivated by the mainspring through a differential gear, so that current interruptions affecting the motor will not affect the action of the mainspring.

Time intervals are regulated on a 24-hour dial which permits one "open" and one "close" in the 24-hour cycle, to one operation every 15 minutes.

Sangamo Time Switch



THE SQUIBB BUILDING, New York City.

Architect: The Firm of Ely Jacques Kahn, New York City
Consulting Engineer: H. B. Oehrig, New York City
General Contractor: Shroder & Kopel, New York City
Plumbing Contractor: F. B. Lasette, Long Island City, N. Y.
Heating Contractor: J. L. Murphy, New York City

In a *Worthy Building* for a *Worthy House*

IN the fine neighborhood of the Savoy Plaza, the New Netherlands and the Plaza Hotel, and taking its place rightfully among such neighbors, the new Squibb Building in New York embodies beauty, convenience, and structural soundness, without and within.

Its proportions are lofty and graceful, its external parts all satisfyingly composed, its approaches and immediate setting dignified, its interior rich in effect and interesting in detail.

In such a building, where architects, engineers, and builders have been free to incorporate the best, it is not strange that piping should be carefully considered and that the major tonnage should be NATIONAL—

America's Standard Wrought Pipe

National Tube Co. : Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

Trade and Miscellaneous Notes

Coming Events

January 27-29, 1931. American Society of Heating and Ventilating Engineers Annual Meeting at Pittsburgh. Headquarters at the William Penn Hotel.

February 10-14, 1931. Fifth Midwestern Engineering and Power Exposition at Chicago, Ill. Headquarters at the Coliseum.

April 13-18, 1931. American Oil Burner Association Convention at Philadelphia. Headquarters at the Benjamin Franklin Hotel.

June 22-25, 1931. Forty-Ninth Annual Convention of the National Association of Master Plumbers, to be held in Milwaukee, Wis. Headquarters, Milwaukee Auditorium.

Manufacturers' Notes

Mid-West Oil Burner Mfg. Co., 3227 Carroll Ave., Chicago, announces that W. A. Kemp is now in charge of sales for their company. Mr. Kemp was formerly with Hardinge Brothers.

J. H. McKone, formerly with Williams Oil-O-Matic in the east, has been appointed eastern representative, with offices at 401 North Broad St., Philadelphia.

Kewanee Boiler Corp., Kewanee, Ill., at a meeting of the Board of Directors, held in New York, October 31, elected the following officers: Chairman of the Board, B. F. Baker; president, R. B. Dickson; secretary, E. F. Wagner; treasurer, Arthur Cook; assistant secretary, R. M. Powers; assistant treasurer, E. H. Karau.

The Duriron Co., Inc., Dayton, O., announces the appointment of B. D. Spofford, formerly advertising manager of the Waco Aircraft Company, as advertising and publicity manager.

Jas. P. Marsh & Co., Chicago, announces the appointment of R. P. Kenney as sales manager in the Pittsburgh district. Mr. Kenney's headquarters will be at 1120 Empire Building, Pittsburgh.

Penn Electric Switch Co., Des Moines, Ia., announces the appointment of Nelson B. Delevan, formerly with the Gould Pump Co., Seneca Falls, N. Y., as sales manager.

Jas. P. Marsh & Co., Chicago, announces the appointment of the following divisional sales managers:

In the eastern district, A. S. Bain, heating division, with headquarters at Washington, D. C., and R. S. Gaisford, industrial instruments and staples sales, at New York.

In the central district, Tom Kenney, Chicago.

In the western district, Paul W. Beggs, Chicago.

The Stanwood Corp., Cincinnati, O., announces the appointment of George E. Seldon as district manager. Mr. Seldon will serve the Detroit territory with offices at 13515 Greiner Avenue.

C. A. Dunham Co., Chicago, announces the organization of a subsidiary, the American Funding Corporation, with an authorized capital of $1,250,000, to handle the Dunham Company's deferred payment business in the installation and remodeling of heating systems. The new subsidiary has already commenced operation.

A. M. Byers Co., Pittsburgh, Pa., announces the appointment of M. J. Czarniecki, assistant general manager of sales, to the newly created position of manager of tubular sales.

Pierce, Butler & Pierce Mfg. Corp., New York, announces the appointment of Charles P. Hackett as district sales manager for the Philadelphia, Baltimore and Washington territory. His headquarters will be at the Philadelphia branch, of which he will also be manager. Mr. Hackett was formerly manager of the Baltimore branch of the company.

Independent Air Filter Company has been formed as an Illinois corporation, with offices and factory at 29 S. Clinton St., Chicago. J. L. Harpham is president and general manager, and Q. G. Ewen is sales manager for the Chicago district.

Rochester Circulator Co., Rochester, N. Y., announce the appointment of J. C. Cordner as their representative in the metropolitan area of New York. Mr. Cordner's address will be 285 Madison Avenue.

The Ohio Electric Mfg. Co., Cleveland, O., announce the appointment of Carl H. Larson as their Chicago District Sales Manager, Motor Department, 333 No. Michigan Ave., effective January 1, 1931. He will also have jurisdiction over Grand Rapids, Mich.

The United States Blower & Heater Corp., Minneapolis, Minn., have appointed the Belanger Fan & Blower Co., Detroit, Mich., as distributors of their products for the lower peninsula of Michigan, for 1931.

Penn Electric Switch Co., Des Moines, Ia., announce the appointment of the following as direct factory representatives: King & Shepherd, 50 Church St., New York, N. Y.; L. C. Price & Co., 136 Federal Bldg., Boston, Mass.; Glen Morris, 2401 Chestnut St., Philadelphia, Pa.; Air & Electric Equipment Co., 564 Erie Bldg., Cleveland, O.; C. G. Tarkington, 622 Broadway, Cincinnati, O.; P. L. Tolerton, 844 Rush St., Chicago, Ill.; Garland-Affolter Engineering Corp., Rialto Bldg., San Francisco, Calif.; Garland-Affolter Engineering Corp., I. W. Hellman Bldg., Los Angeles, Calif.; Garland-Affolter Engineering Corp., Alaska Bldg., Seattle, Wash.

Pettigrew Foundry Co., 540 No. Michigan Ave., Chicago, manufacturers of the "Stoker-Boy," announce the formation of the Stoker Boy Sales Corp., 1001-11 Straus Building, Chicago, for the purpose of distributing its line of stokers nationally.

The board of directors of the corporation will contain seven members, five of whom are: Harry W. Eckland, Lafayette Markle, Elbert O. Smith, Theodore J. Franzen and Archer L. Jackson.

G. A. Slaght and George E. Tobey have joined the new corporation in the capacities of division managers, and Edward M. Miller will act as director of sales.

G. A. Conrath, the designer of the "Stoker-Boy," will be closely identified with the sales department.

The Illinois Stoker Co., Alton, Ill., manufacturers of natural and forced draft chain grate stokers, announce the establishment of an eastern office at 30 Church St., New York. Alex Girtanner will be in charge of this office.

The Lincoln Electric Co., Cleveland O., announce the appointment of S. H. Taylor, Jr., to succeed W. S. Stewart in charge of the Pacific Coast territory with headquarters at 812 Mateo St., Los Angeles, Calif. Mr. Stewart has recently been appointed district manager of the Cleveland territory of the company.

L. P. Henderson was appointed manager of the San Francisco office, and E. J. Pfister, formerly of the Philadelphia and Allentown offices, was appointed district manager of the Kansas City district, with offices at 405 R. A. Long Building, 10th and Grand Sts., in that city.

American Radiator & Standard Sanitary Corp., 40 West 40th St., New York, announce the following appointments:

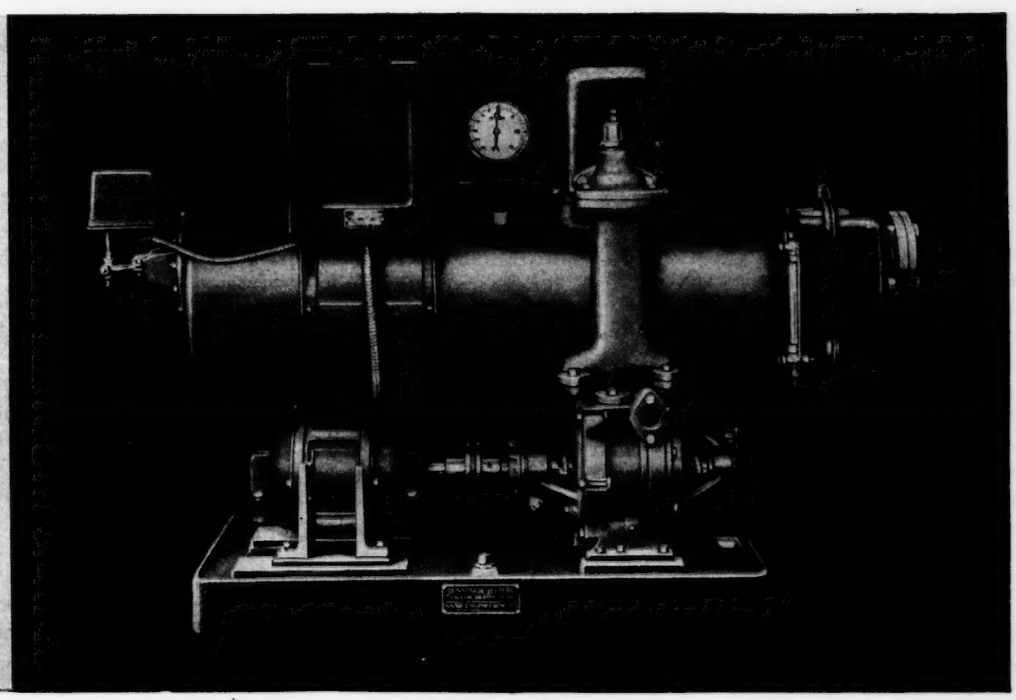
M. J. Beirn, vice-president and general

GENEROUS CAPACITY at minimum horsepower

THE JENNINGS Vacuum Heating Pump consists of two independent units. One pumps only water, the other only air.

Each unit can be, and is, designed for maximum efficiency. The total capacity of the pump is the maximum capacity of the air unit plus the maximum capacity of the water unit. Satisfactory handling of extra loads which may be caused by leaks in the heating system, the excessive use of lifts and a dozen other factors, is assured.

True of no other heating pump, this feature also results in more economical operation. Neither unit is ever overloaded by having to handle air and water at the same time. Less power is required to drive the pump. Write for Bulletin 85. The Nash Engineering Co., 81 Wilson Road, South Norwalk, Conn.

Jennings Pumps

Jennings Vacuum Heating Pumps are furnished in standard sizes with capacities of 4 to 400 g. p. m. of water and 3 to 171 cu. ft. per min. of air. For serving up to 300,000 sq. ft. equivalent direct radiation.